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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 60

THE BARNACLES (CIRRIPEDIA) CONTAINED IN THE COLLECTIONS OF THE U. S. NATIONAL MUSEUM

BY

HENRY A. PILSBRY

Special Curator of the Department of Mollusca, Academy of Natural Sciences of Philadelphia

WASHINGTON
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ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—the *Bulletin* and the *Proceedings*.

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This work forms No. 60 of the Bulletin series.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as bulletins.

The *Proceedings*, the first volume of which was issued in 1878, are intended as a medium of publication of brief original papers based on the collections of the National Museum, and setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually, or oftener, for distribution to libraries and scientific establishments, and in view of the importance of the more prompt dissemination of new facts a limited edition of each paper is printed in pamphlet form in advance.

CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

WASHINGTON, U. S. A., *October 8, 1907.*

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THE BARNACLES (CIRRIPEDIA) CONTAINED IN THE COLLECTIONS OF THE U. S. NATIONAL MUSEUM.

By Henry A. Pilsbry,

Special Curator of the Department of Mollusca, Academy of Natural Sciences of Philadelphia.

INTRODUCTION.

The collection of Cirripedes in the United States National Museum contains material derived from many sources. The most extensive series was received from the United States Bureau of Fisheries, and is due to the work of the steamers *Albatross* and *Fish Hawk* during the past twenty-five years or more in both Atlantic and Pacific waters. A considerable series of European forms was included in the Jeffreys collection of mollusks purchased by the United States National Museum, most of them preserved dry. Smaller accessions from many localities, chiefly American, are the gifts of friends of the Museum. From these several sources a good representation of the shore and pelagic forms of both Atlantic and Pacific coasts has been obtained, with a rich though doubtless incomplete fauna of the deep-water cirripedes of the east coast, and a much less complete collection of those of the west.

The present paper deals with the pedunculate cirripedes and the sessile family Verrucidæ only. All species represented in the National Museum are mentioned or described, and incidentally all known species of the United States and adjacent waters are treated monographically, though descriptive matter relating to well-known forms is restricted to keys for the determination of species.[a] Up to this time only about a dozen species of pedunculate cirripedes have been recorded

[a] The present paper should be used in connection with the writer's reports on Hawaiian and West American Cirripedes, Bulletin of the U. S. Fish Commission, XXVI, pp. 179–204, which also deal with material in the National Museum. Species discussed in those reports are mentioned herein only when additional material has come to hand.

from North American waters, and no Verrucidæ. The Pedunculata now known from our coasts number 56 species and 9 subspecies, and the Verrucidæ 5 species and 1 subspecies.

A few notes on the distribution of the species may be useful. With one exception, all of our pelagic cirripedes are very widely distributed forms, already known, from many Atlantic and Pacific localities. One pelagic species, *Alepas pacifica*, materially enlarges our knowledge of a small and little-known group of forms commensal on large medusæ. Those having opportunity should especially look for barnacles of this type.

The deep-water forms, both of Lepadidæ and Verrucidæ, support the opinions advanced by Hoek, Annandale, and others that deep-sea cirripedes have a very wide distribution. The deep-water fauna of the Atlantic is fairly homogeneous, many of the species from off our coast being very closely related to those from the Azores and eastward, while some species of *Scalpellum* range from off Nova Scotia to southern Europe and south to Tristan da Cunha. The number of very large species of *Scalpellum*, *Pœcilasma*, and *Verruca*, found off our east coast, is unequaled, so far as I know, in any area of equal extent. A considerable number of North Atlantic species stand very close to Pacific and Indian Ocean forms, and a few are probably identical specifically.

Exclusive of pelagic forms, the species of the Atlantic and Pacific coasts of the United States are distinct, with possibly one exception,[a] but several of the Californian species are closely related to those of the Atlantic.

From the very scanty data at hand it seems that the Antillean region is an area of specific differentiation, a number of very distinct specific types, not related to known Atlantic forms, occurring there. A comparison of this fauna with the Panamic will doubtless prove interesting, but nothing is yet known of Panamic cirripedes.

In the generic nomenclature I have been obliged to make various changes from the ordinary usage, yet only in cases where the universally accepted rules of priority have been transgressed. A few new generic and subgeneric terms are introduced, chiefly for groups nearly or quite unknown in the time of Darwin.

The privilege of studying these barnacles I owe to Dr. Richard Rathbun, assistant secretary in charge of the United States National Museum. I am indebted also to Prof. G. O. Sars for the gift of examples of *Scalpellum*. Finally I must thank Miss Helen Winchester for her careful work in drawing the illustrations for this paper.

[a] *Scalpellum regium latidorsum*, an Atlantic form, specimens of which are labeled as from a station off British Columbia. No Pacific species was taken with them.

Family LEPADIDÆ Darwin.

Cirripedia having a peduncle, flexible and provided with muscles. Scuta furnished only with an adductor muscle; other valves, when present, not united into an immovable ring (Darwin).

Professor Gruvel has proposed to dismember the family Lepadidæ, recognizing four families, nearly corresponding with the groups herein recognized as subfamilies, thus:

Polyaspidæ Gruvel=Scalpellinæ.

Pentaspidæ Gruvel=Lepadinæ + *Conchoderma* and *Oxynaspis*.

Tetraspidæ Gruvel=Iblinæ.

Anaspidæ Gruvel=Alepadinæ—*Conchoderma*.

I would probably have accepted Gruvel's families had the names been based upon generic terms; yet in that case I would be disposed to place *Oxynaspis* with *Scalpellum* rather than with *Lepas*, and on account of the structure of the scutum I would group *Conchoderma* with *Alepas*, though the armature of the cirri is different, and may indicate a closer relation to the pentaspidian group.

The terminology of the external parts of pedunculate barnacles is sufficiently explained by the following diagrams:

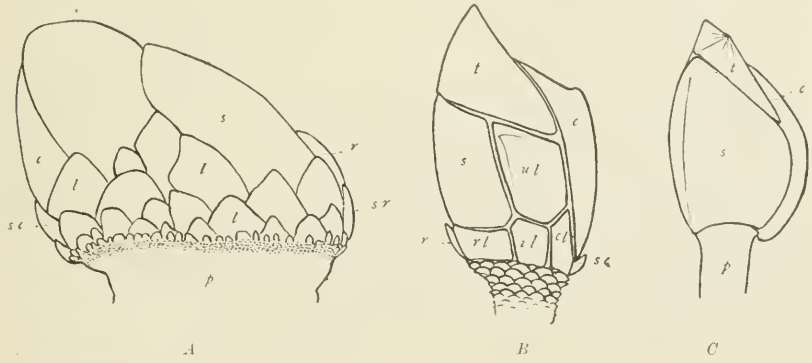

FIG. 1.—LATERAL VIEWS OF (*A*) MITELLA, (*B*) SCALPELLUM, AND (*C*) LEPAS. *c*, CARINA; *cl*, CARINAL LATUS; *il*, INFRAMEDIAN LATUS; *l*, LATERA; *p*, PEDUNCLE; *r*, ROSTRUM; *rl*, ROSTRAL LATUS; *s*, SCUTUM; *sc*, SUBCARINA; *t*, TERGUM, *ul*, UPPER LATUS.

KEY TO THE GENERA OF LEPADIDÆ.[a]

a. Umbones of scuta and carina above the middle of the plates or apical; a basal whorl of plates below the principal five; peduncle scaly.

Subfamily SCALPELLINÆ.

b. Valves 18 or more, all with apical umbones; latera in the basal whorl numerous.

Genus *Mitella*.

bb. Valves 12 to 15, the basal whorl of plates with 2 or 3 pairs of latera.

Genus *Scalpellum*.

[a] With the exception of *Ibla*, all the genera included in this key occur in North American waters. Only such genera as are treated of in the following pages are included in the key.

bbb. Valves 8, all with apical umbones, and finely crenated lines of growth, the scuta, terga, and carina large, rostrum and one pair of latera small; peduncle covered with small scales, those of the upper row crenated; terminating at the base in a calcareous cup or row of disks ..... Genus *Lithotrya.*

aa. Umbones of scuta and terga apical, no other valves present; peduncle covered with chitinous spines..... Subfamily IBLINÆ.

b. Valves 4; characters those of the subfamily ..... Genus *Ibla.*

aaa. Valves 5; terga, scuta, and carina large, the latter two having umbones slightly above the middle of the plates; carina angularly bent; peduncle with calcareous spines..... Subfamily OXYNASPIDINÆ. Genus *Oxynaspis.*

aaaa. Valves 3 to 5; carina with the two ends unlike, the umbo basal or below the middle; umbo of scutum at or near the rostral angle; caudal appendages one-jointed; peduncle nude..... Subfamily LEPADINÆ.

b. Plates fully calcified, approximate.

c. Carina extending upward between the terga; one or more lateral filaments at bases of first cirri; caudal appendages smooth ..... Genus *Lepas.*

cc. Carina extending to the base of the terga, truncate at base; no lateral filaments; caudal appendages spinose.

d. Carina narrow throughout ..... Genus *Poecilasma.*

dd. Carina with wide sides toward the base ..... Genus *Megalasma.*

bb. Plates incompletely calcified, the hard portions separated by wide chitinous spaces; scutum calcified in two or three diverging branches; carina terminating below in a disk, cup, or fork at the base of the capitulum. Valves 5 or sometimes apparently 7 ..... Genus *Octolasmis.*

aaaaa. Valves wanting, or greatly reduced, widely separated and inconspicuous, scuta when present with the umbones near the middle of the occludent margin. Subfamily ALEPADINÆ.

b. Valves 2 to 5, very small; carina, when present, with the upper and lower ends nearly alike; lateral filaments at bases of first pair of cirri; caudal appendages wanting. Living attached to floating objects ..... Genus *Conchoderma.*

bb. Only a pair of vestigeal scuta developed; integument thin, without internal muscular layer; cirri unusually short, composed of few joints; caudal appendages one-jointed. Living attached to medusæ..... Genus *Alepas.*

bbb. Capitulum wholly without plates, or with a pair of vestigeal scuta, a muscular layer underlying the integument; cirri long; caudal appendages well developed, composed of several spinose segments. Living attached to objects on the bottom..... Genus *Heteralepas.*

Subfamily SCALPELLINÆ.

Genus MITELLA Oken.

1815. *Mitella* OKEN, Lehrbuch der Zoologie, 1, p. 362, for *Lepas pollicipes.*

1817. *Pollicipes* LEACH, Journal de Physique, LXXXV, p. 68, July, 1817, no type mentioned.

1851. *Pollicipes* DARWIN, Monograph on the Cirripedia, p. 293, and of authors.

1904. *Vaucheria* PALLARY, Journal de Conchyliologie, LII, p. 7.

It is much to be regretted that Darwin allowed the general use of the name *Pollicipes* to influence his course in rejecting the earliest generic name for this group, contrary, as he writes, to the rules of the British Association. Had he accepted the earliest name, it would long ago have become universally current. As matters stand we have no option but to use the generic term *Mitella*, which Darwin himself showed to

be prior to *Pollicipes*. The supposed new genus *Vaucheria* was based on the scutum of *Mitella pollicipes*, which was thought to be the internal shell of a slug.

The few species of *Mitella* are littoral barnacles, often extremely abundant. The eastern American shores are without species; but one occurs on the west coast.

MITELLA POLLICIPES (Gmelin).

1790. *Lepas pollicipes* Gmelin, Syst. Nat., 13th ed., p. 3213 (in Mari Mediterraneo).
1790. *Lepas gallorum* Spengler, Skrifter Naturhist. Selskabet, 1, pl. vi, fig. 9.
1824. *Pollicipes cornucopia* Leach, Encycl. Brit., Suppl. III, and of Darwin, Monograph on the Cirripedia, 1851, p. 298, pl. vii, fig. 1, and subsequent authors.
1904. *Vaucheria tingitana* Pallary, Journ. de Conchyliologie, LII, p. 7, pl. iii, figs. 2, 3, 4.

Localities.—No. 13008, U.S.N.M., France, Thos. Wilson. No. 12377, Gulf of Gascony, J. Gwyn Jeffreys collection. No. 12392, Biarritz, "eatable and sold in the market," Jeffreys collection. Ile Dieu, Océan, Isaac Lea collection.

MITELLA POLYMERUS (Sowerby).

1833. *Pollicipes polymerus* Sowerby, Proc. Zool. Soc. Lond., p. 74 (coast of California).
1851. *Pollicipes polymerus* Sowerby, Darwin, Monograph on the Cirripedia, p. 307, pl. vii, fig. 2.

Localities.—Plover Bay, near Bering Strait, Siberia, associated with *Conchoderma auritum* and *Coronula diadema*, on a humpback whale (*Megaptera versabilis* Cope), taken by Captain Redfield, W. H. Dall, Western Union Telegraph Expedition, 1865. No. 6609, Tledoo village, near Susk, British Columbia, James G. Swan. No. 32889, Barclay Sound, British Columbia, *Albatross*. No. 9203, Neah Bay, Washington, James G. Swan. Mouth of Columbia River, Raymond. No. 32883, "Upper California," T. Nuttall, as *P. mortoni* Conrad. Isaac Lea collection. No. 32887, Drakes Bay, California, *Albatross*. No. 3083, Wilmington, California, D. S. Jordan. No. 32890, Monterey Bay, W. H. Dall. No. 11145, Santa Rosa Island, California, P. Schumacher. Nos. 2547, 11152 (and 28510?), San Diego, California, C. R. Orcutt, O. N. Sanford, and Edgar A. Mearns, U. S. Army. No. 32888, San Quentin Bay, Lower California. No. 32882, Rosario, Lower California.

This common species of the west coast is readily known by the numerous irregularly arranged scales at the base of the capitulum. The valves are usually much worn, and the peduncle is covered with very fine scales. Dr. W. H. Dall took specimens from a humpback whale in Bering Sea, the highest latitude known for a member of this genus. These specimens I at first thought were *M. pollicipes*, as they have lost many of the lower plates, perhaps by the solvent action of the preservative. (Fig. 1A.)

MITELLA MITELLA (Linnæus).

1758. *Lepas mitella* Linnæus, Syst. Nat., 10th ed., p. 668.
1851. *Pollicipes mitella* Darwin, Monograph on the Cirripedia, p. 316, pl. vii, fig. 3.

Localities.—No. 32891, Pago Pago, Tutuila, Samoan Islands, Sir Charles Eliot. Sumatra, I. Lea collection. No. 32880, Turon Bay, Cochin China, Isaac Lea collection. No. 32881, Hongkong, China, Wm. Stimpson, North Pacific Exploring Expedition. No. 32892, Fusan, Korea, P. L. Jouy. Nos. 22392, 25379, and 26708, Japan, R. Hitchcock and H. Loomis. No. 16295, near Enoshima, Japan, F. Stearns.

Genus LITHOTRYA Sowerby.

1851. *Lithotrya* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 332.

LITHOTRYA PACIFICA Borradaile.

1900. *L. pacifica* Borradaile, Proc. Zool. Soc., p. 798, pl. li, figs. 3, 3*a* (Funafuti, outer reef).

Localities.—Makemo, Paumotus, on the reef, *Albatross*, October 21, 1899. Funafuti, Ellice Islands, reef, *Albatross*, December 24, 1899.

This form is probably not distinct specifically from *L. nicobarica* Reinhardt, which, however, has the lateral plate shorter. Many of the specimens taken at Paumotus are much larger than Borradaile's type. An adult but not old example measures: total length, 62 mm.; length of carina, 19.5 mm.; carino-rostral diameter of capitulum, 15 mm. A small example was collected at Funafuti, the type locality.

LITHOTRYA DORSALIS (Ellis).

1851. *L. dorsalis* Ellis in Darwin, Monograph on the Cirripedia, Lepadidæ, p. 351.

Localities.—No. 11529, San Salvador, *Albatross*, 1886. Specimens are also reported as in the Museum from Jamaica and Porto Rico.

Genus SCALPELLUM Leach.

1817. *Scalpellum* Leach, Journal de Physique, de Chimie, d'histoire naturelle et des arts, LXXXV, p. 68.
1851. Darwin, Monograph on the Cirripedia, Lepadidæ, p. 215.
1883. Hoek, Challenger Report, VIII, Cirripedia, p. 59.
1905. Gruvel, Monographie des Cirrhipèdes, p. 23.

Scalpellum is much the largest and most varied genus of Pedunculate cirripedes, numbering about 140 species. The types of 38 species and 7 subspecies are in the collection of the Museum. A very large proportion of the species occur in depths of over 100 fathoms, and new forms are constantly brought to light by the various expeditions for

the exploration of the sea bottom. The number of species known is probably only a fraction of those actually existing.

The current classification of the species of *Scalpellum* we owe to Dr. Hoek, who composed this scheme of the major groups:

A. Valves imperfectly calcified.
B. Valves perfectly calcified.
  A. A portion of the carina projecting freely.
  B. Carina angularly bent.
  C. Carina simply bowed.
    a. With a subcarina.
    b. Without a subcarina.
      a. Species with a rostrum.
      b. Species without a rostrum.

While this grouping and its amplification in Hoek's key to the species and in Gruvel's later monograph has been of enormous assistance to subsequent students, yet it often fails to show the true relationships of many of the species now known, owing to the fact that *the shape of the carina and the presence or absence of a rostrum are characters in which there is diversity among very closely related species.* I need only instance *S. stroemii* and its immediate allies, forms no doubt closely akin, yet distributed into two of Hoek's divisions by the characters of the carina; and the species related to *S. velutinum*, some of which have a small rostrum, others none. Whether a more natural key will also prove more convenient in practical use than one employing artificial characters remains to be tested. An attempt is made below to indicate the natural groups within the genus, so far as I can determine them by the material before me. The data existing on the complemental males supports the new classification proposed.

KEY TO SUBGENERA AND SECTIONS OF THE GENUS SCALPELLUM.

a. Female and hermaphrodite with a subcarina; male with a distinct capitulum and peduncle.
  b. Only the tergum interposed between the scutum and carina; capitulum *Pollicipes*-like; male with the capitulum protected by 6 well-developed plates ..... I. Subgenus *Calantica*, p. 8.
  bb. An upper lateral plate interposed below the tergum, between scutum and carina; capitulum resembling that of normal *Scalpellum* in general shape. II. Subgenus *Smilium*, p. 13.
aa. No subcarina present; upper lateral plate occupying the middle of the side of the capitulum; male oblong, not divided into capitulum and peduncle, with minute valves or none ..... Subgenus *Scalpellum*.
  b. Plates well calcified, none of them V-shaped.
    c. Inframedian latus large, subquadrate, pentagonal or rounded-oval, wide in the upper part, the umbo not above the middle. III. Section *Scalpellum, s. str.*, p. 13.

cc. Inframedian latus small or narrow, triangular, hourglass-shaped, or irregular.

d. Rostral latus low, usually twice as wide as high.

IV. Section *Holoscalpellum*, p. 25.

dd. Rostral latus usually as high as wide, with short basal margin.

V. Section—p. 47.

bb. Plates imperfectly calcified, at least the tergum V-shaped.[a]

VI. Section *Neoscalpellum*, p. 69.

Keys to the species described in this report, and incidentally to all known North American forms, are given under each sectional head below.

The subgenera *Calantica* and *Smilium* should, in my opinion, be elevated to the rank of genera; but as only two species of *Calantica* and none of *Smilium* are described in this paper, I have followed the current generic arrangement. Both groups are more primitive than *Scalpellum*, and *Calantica* was probably ancestral to *Scalpellum* and *Smilium*.

Sections IV and V are mutually more closely related than the others, yet, as they seem to constitute natural phyla and are very numerous in species, I have retained them separate. The rostrum may be either present, vestigeal, or absent in the last four groups.

I. Subgenus CALANTICA Gray.

1825. *Calantica* Gray, Annals of Philosophy, n. ser., X, p. 101, for *S. villosum* Leach.

The capitulum has two whorls of plates, the upper consisting of scuta, terga, and carina, the terga occupying all the space between scuta and carina; lower whorl consisting of three pairs of latera, rostrum, and subcarina. Umbones of all the plates are apical. Complemental males with a distinct capitulum furnished with valves and a peduncle. Type, S. villosum.

The capitulum closely resembles that of *Pollicipes*, yet differs (1) by greater specialization of the armour, there being but a single basal whorl of plates, and (2) by the presence of complemental males, as in *Scalpellum* and *Ibla*, yet these males resemble miniatures of the hermaphrodite form. *Scalpellum* differs from *Calantica* chiefly by the elevation of the lateral plates, which become, as "upper latera," members of the upper whorl of plates, and thereby modify the relative positions and shapes of the terga and scuta. In the typical forms of *Calantica* the median lateral plate can not properly be called an "upper

[a] Section VI, as defined in this key, would include forms of diverse ancestry, but parallel in the one character of reduction of the calcified portions; and in actual practice all such species would have to be given place in a key to the species of this section, though they should be grouped with their real allies. In dealing with parallel phyla it is probably impossible to construct a key for the convenient determination of specimens without using artificial characters.

latus," since it is clearly, by form and position, a member of the lower whorl of plates. It is, however, clearly homologous with the plate which became an upper latus in the more advanced and specialized forms of *Scalpellum*. An intermediate stage is represented by *S. pollicipedoides* Hoek[a] and various other species.

The two species to be described below belong to two rather distinct groups of this subgenus, definable as follows:

I. Section *Calantica s. str.* Plates of the lower whorl low and wide, triangular, small and separated, not concealing the bases of the upper whorl of plates. Scales of the peduncle minute. Plates covered with a distinct cuticle. Western Pacific.

S. villosum Leach, "Eastern Seas."

S. pollicipedoides Hoek, south of New Guinea.

S. trispinosum Hoek, Sulu Sea, 82–102 fathoms.

S. eos Pilsbry, Japan, 71 fathoms.

II. Section *Scillælepas* Seguenza. Plates of the lower whorl well developed, high and recurved, covering the bases of those of the upper whorl. Peduncle very short, covered with scales of moderate size. Plates conspicuously calcareous, not covered with a distinct cuticle. Atlantic and Arctic oceans.[b]

S. calyculus Aurivillius, Azores, 850–900 meters.

S. falcatum Aurivillius, Azores, 454 meters.

S. gemma Aurivillius, Greenland, 1,800 meters.

S. superbum Pilsbry, off S. E. United States, 352–440 fathoms.

S. grimaldi Aurivillius, Azores, 845–1,230 meters.

SCALPELLUM EOS, new species.

Type.—Cat. No. 32877, U.S.N.M.

Type-locality.—*Albatross* Station 3741, off Ose-zaki, Hondo, Japan, in 71 fathoms, on a large *Balanus*.

The capitulum is subtriangular, compressed, the ventral margin nearly straight, with armour of 13 plates, those of the lower whorl very small and inconspicuous; covered with a smooth, yellowish cuticle. The plates are lightly marked with lines of growth and a few weak coarse radial striæ on the ventral half of the scutum. Sutures linear. The umbones of all the plates are apical.

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[a] See Hoek, Koninklijke Akademie van Wetenschappen te Amsterdam, Proceedings of the section of Sciences, VII, p. 92, figs. 4–6 (Dec., 1904).

[b] The group *Scillælepas* was established by Seguenza in 1872 for Italian and Sicilian miocene and pliocene forms, with the type *S. carinatus* (*Pollicipes carinatus* Philippi). It was correctly recognized as a group intermediate between *Pollicipes* and *Scalpellum*. The earlier species appeared in the Cretaceous. The miocene and pliocene forms are very closely related to modern deep-water species of the Atlantic, and should be carefully compared therewith. Good descriptions and figures of them may be found in G. de Alessandri, Studi Monografici sui Cirripedi fossili d'Italia, in Palaeontographica Italica, XII, 1906, pp. 243, 263.

The scutum is triangular, its basal width more than half the length. The occludent margin is barely convex, the tergal margin straight, the apex erect.

The tergum is long, subtriangular, narrower than the scutum. Its occludent and scutal margins are straight, carinal margin somewhat convex. The apex is erect.

The carina is narrow, very slightly curved, with rounded roof.

The rostrum is triangular, much broader than high, with incurved apex.

The rostral latus is obliquely triangular, broader than high, with incurved apex.

The median lateral plate is triangular, about twice as wide as high.

The carinal latus is obliquely triangular, shaped like the rostral latus, with an incurved apex.

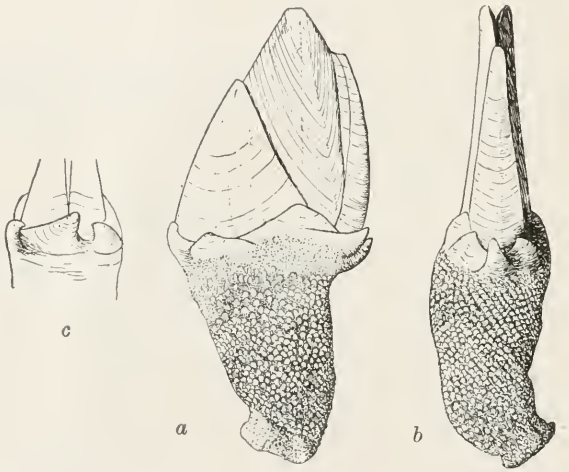


FIG. 2.—SCALPELLUM EOS. *a*, ROSTRAL; *b*, LATERAL; *c*, CARINAL VIEWS OF THE TYPE-SPECIMEN.

The subcarina is triangular, higher than wide.

The peduncle is very large, subcylindric. Its lower half is clothed with very small, convex, rounded, slightly separated scales, higher than wide, and about 0.3 mm. long. These disappear on the upper part of the peduncle, which is nude.

The two cotypes measure as follows:

Length of capitulum 18, width at base 14.5 mm. Length of the peduncle 20 mm. (Fig. 2.)

Length of capitulum 15, width at base 12 mm. Length of the peduncle 13 mm.

This species is related to *S. villosum* Leach, but not very closely. The carina is narrower, the terga erect, not recurved. The scuta are higher and the rostrum is smaller. The cuticle is smooth, not downy as in *S. villosum*.

Scalpellum trispinosum Hoek[a] is somewhat more nearly related to *S. eos*, but differs by the projecting summits of the scuta and carina, the smaller rostral latera, and the shortly villose cuticle.

The rostrum and subcarina seem to be very frequently asymmetrical in the section *Calantica*. In the smaller of the two cotypes of *S. eos* the rostrum is strongly bent toward the right side and the subcarina slightly so. In the larger specimen the subcarina is slightly bent toward the left, the rostrum being symmetrical. Neither of them shows any trace of a subrostrum, such as is developed in *S. villosum*.

SCALPELLUM SUPERBUM, new species.

Type.—Cat. No. 11525, U.S.N.M.

Type-locality.—*Albatross* Station 2669, north latitude 31° 09′, west longitude 79° 33′ 30″, between the Bahamas and Cape Fear, North Carolina, in 352 fathoms, on a branching white coral. Bottom temperature 43.7°.

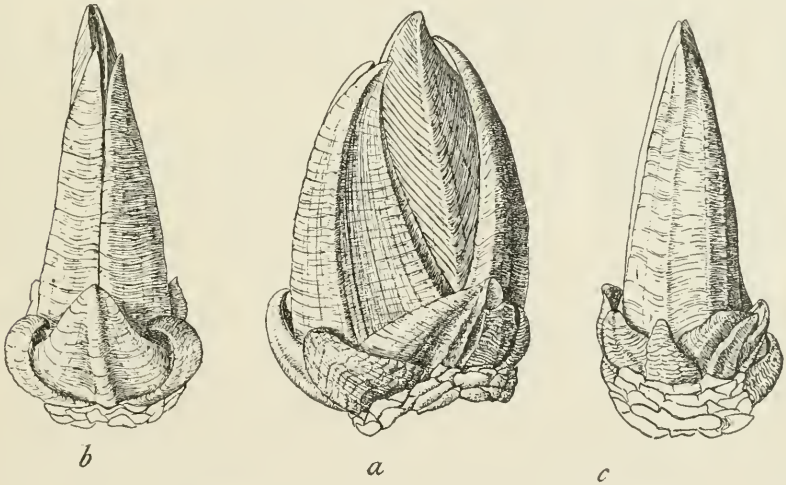


FIG. 3.—SCALPELLUM SUPERBUM. *a*, VENTRAL, *b*, LATERAL, AND *c*, DORSAL VIEWS OF THE TYPE-SPECIMEN. (Nat. size.)

Other localities.—No. 9920, U.S.N.M., Station 2415, north latitude 30° 44′, west longitude 79° 26′, in 440 fathoms, bottom temperature 45.6°, on branching white coral.

The capitulum is somewhat triangular, like that of *S. trispinosum* Hoek, wide and thick at the base, composed of 13 strong white plates, without perceptible cuticle. The plates are sculptured with radiating striæ crossed by growth-lines.

The scutum is pyramidal with recurved apex, and has a strong median ridge from the apex to the middle of the lower margin. Radiating striæ are fine and well developed on the lateral half of the

[a] Challenger Report, VIII, Cirripedia, p. 72, pl. VI, figs. 15, 16.

plate. The basal margin is concealed under the lower whorl of plates.

The tergum is in part concealed under the margins of the scuta and carina. The visible part is divided into two equal areas by a prominent median ridge running from apex to base. The summit is erect, only a trifle recurved.

The carina is not much curved, its apex not inserted between the terga. The roof is strongly carinate along the median line, sloping and sculptured with radial striæ on each side of the keel. It is very wide at the base. The sides are narrow and incurved.

The rostrum is triangular, nearly as wide as high, with incurved apex, and having a very strong median longitudinal rib.

The rostral lateral plate is obliquely triangular, with incurved apex. The surface is coarsely sculptured with several very low radial ribs, numerous fine radial striæ, and curved, coarse, low growth-wrinkles. The base of the plate overlies the adjacent bases of the rostrum and inframedian latera. There is no subrostrum.

The median lateral plate is oblique, triangular, much wider than high, with the apex incurved and twisted. A strong flat-topped rib runs from the apex to the basal margin, which in the middle rests directly upon the peduncle.

The carinal latus is oblique, triangular, with the apex curved under those of the inframedian plates. The surface is ribbed.

The subcarina is triangular, usually asymmetrical, with an incurved apex.

The peduncle is very short, and densely covered with large, strongly imbricating white scales.

Length of the capitulum 46, width 34 mm. Length of the visible part of the carina 38, diameter 14 mm. (Fig. 3.)

The plates show some variations in shape in the four specimens taken, the subcarina especially being irregular. It is bent more or less to the right of the median line in two specimens from Station 2669, and to the left in two from Station 2415. In one of those from the latter station the carina and scuta are straightened, the apices projecting, exactly as in *S. trispinosum* Hoek.

Two specimens from Station 2415 measure: Length of capitulum 35, width 28 mm. Length of peduncle 12 mm.

Length of capitulum 28, width 22 mm. Length of peduncle 15 mm.

S. superbum is closely related to *S. gemma* Aurivillius,[a] but it differs by the much longer scuta, which reach almost to the summits of the terga, by the far narrower terga, less recurved at the apices; by the much wider roof of the carina, and finally by the comparatively smaller size of the plates of the lower whorl, and the different

[a] Studien über Cirripeden, in Kongl. Svenska Vetenskaps-Akad. Handlingar, XXVI, 1894, no. 7, p. 41. East coast of Greenland, in 1,800 meters.

shape of the median lateral plates, which are also situated lower. *S. grimaldi* Aurivillius, from the Azores in 845 to 1,230 meters, which has not yet been figured, is probably even nearer our west Atlantic species, but it differs by the straight carina, the shorter subcarina, only a third the length of the rostrum, and by having the apex of the carina intruding a little between the terga. Until a full description and figures are published, the exact relationship of *S. grimaldi* to *S. superbum* can not be determined.

In the figured type of *S. superbum* the upper latus on the side shown is a little abnormal in having an erect apex. It is normally incurved on the other side of the same specimen, as shown on the right side of the dorsal view. The peduncle, too, is broken off short in this example.

II. Subgenus SMILIUM Gray.

1825. *Smilium* Gray, Annals of Philosophy, new ser., X, p. 100 (*S. peronii* only).

Upper latus occupying the space between scutum and carina, below the tergum; two or three pairs of latera, with rostrum and subcarina forming the lower whorl of plates. Plates 13 or 15. Complemental male having a normal peduncle and capitulum, the latter with plates. Type, S. peronii Gray.

In this group the position of the upper latus and the general structure of the capitulum approximate to the condition in typical *Scalpellum;* but the presence of a subcarina and the primitive *Pollicipes*-like male indicate greater affinity to the subgenus *Calantica.* The known species may be grouped as follows:

a. Valves 13, inframedian latera wanting; male with triangular capitulum and six well-developed valves. *S. peronii* Gray, *S. scorpio* Aurivillius, *S. sexcornutum* Pilsbry.

aa. Valves 15, three pairs of basal latera being present; male more degenerate, with oblong capitulum and three small valves.

b. Carina angularly bent; umbo of scutum not apical. *S. rostratum* Darwin, *S. ranzi* Gruvel.

bb. Carina bowed, with apical umbo; umbo of scutum apical. *S. squamuliferum* Weltner, *S. stratum* Aurivillius, *S. bengalense* Annandale.

These forms are oriental and austral in distribution, and none are represented in the U. S. National Museum collection.

III. Subgenus SCALPELLUM, s. str.

Valves usually wholly calcified; carina usually angularly bent, with the umbo removed from the apex; inframedian latus wide throughout, the umbo at or below the middle of its height; males sacklike, not divided into capitulum and peduncle, with minute valves or none. Type, S. scalpellum.

This series is chiefly characterized by the broad inframedian latus, with facets of the wide summit against both scutum and upper latus,

and with the umbo at or below the middle, never apical. Besides the species mentioned below, the following seem to belong to this group: *S. calcaratum* Aurivillius, *S. ornatum* Gray, *S. salartiæ* Gruvel, *S. hamatum* Sars.

KEY TO NORTH AMERICAN SPECIES.

a. Umbo of the scutum at its upper third; carina angular near the middle; umbo of the inframedian latus subcentral. Gulf of Mexico.....*S. gibbum.*

aa. Umbo of the scutum near the apex; carina regularly bowed with apical umbo; inframedian latus large, pentagonal, or rounded, with subcentral umbo; profusely hairy. Californian forms.

b. Valves imperfectly calcified at the indistinct edges, the chitinous sutures very wide.....*S. californicum.*

bb. Valves strongly calcified, with distinct edges; sutures narrower. *S. osseum.*

aaa. Umbo of the scutum apical, that of the quadrate inframedian latus on its rostral border. North Atlantic and Arctic forms.

b. Width of the inframedian latus less than half its height; rostrum narrow, tapering upward.....*S. pressum.*

bb. Width of the inframedian latus more than half its height.

c. Umbo of the inframedian latus near the middle of its rostral edge.

d. Rostrum narrow .....*S. stroemii.*

dd. Rostrum wide, triangular.....*S. stroemii latirostrum.*

cc. Umbo of the inframedian latus near the rostro-basal angle of the plate .....*S. stroemii substroemii.*

This section comprises several subsidiary phyla, and the group of *S. stroemii* could with some reason be removed to form a separate section, characterized by the high rostral latera of the female and hermaphrodite forms and the more degenerate complemental males, which have been investigated in *S. stroemii* and *S. nymphocola* by Hoek.

In *S. patagonicum* and *S. inerme* there has been reduction of the calcareous portions of the valves, the general structure not being much altered otherwise.

GROUP OF SCALPELLUM SCALPELLUM.

SCALPELLUM STEARNSII Pilsbry.

1890. *Scalpellum stearnsii* Pilsbry, The Nautilus, IV, p. 96 (December, 1890); Proc. Acad. Nat. Sci. Phila., 1890, p. 441 (Feb. 3, 1891).—Gruvel, Monographie des Cirrhipèdes, 1905, p. 44.

Localities.—Cat. No. 32873, U.S.N.M., east coast of Japan between the bay of Tokyo and the Inland Sea, F. Stearns, one of the original lot, dry. No. 32874, Japan, collector unknown, dry. No. 22152, Japan, H. Loomis, dry. No. 32875, *Albatross* Station 3704, Seno Umi, off Hondo Island, Japan, 94 fathoms.

Two of the four specimens in the collection surpass the type of the species in size, measuring as follows:

No. 32873, a dry specimen: Length of capitulum 52, breadth 36 mm; length of peduncle 35 mm; length of carina 53, diameter at base 7 mm. No. 32875, an alcoholic specimen; length of capitulum 50, breadth 34 mm; length of peduncle 58 mm; length of carina 49, diameter at base 8 mm.

In the dry examples the peduncle is much shortened and the scales become crowded. In the alcoholic individual taken by the *Albatross* the peduncle is longer than the capitulum, and the scales are seen to be arranged in circular whorls separated by chitinous nude intervals. There are 15 such whorls, not counting some much smaller, irregularly placed scales at the base of attachment, each whorl being composed of about 17 scales. These are placed obliquely, the upper and ventral end of each scale imbricating over the lower and dorsal end of the following scale.

The capitulum and peduncle are covered with a gray cuticle, which is distinctly velvety to the touch. This was not apparent in the dry examples, and hence was not noticed in the original description.

In No. 32875 the carina is more robust, with the umbo removed a little more from the summit of the plate than in the type lot. Moreover, the carina reaches farther up toward the apex of the tergum, its end being at the upper fourth of the carinal margin of the tergum, while in the type lot it is but little beyond the upper third.

An alcoholic example taken by the Fisheries steamer *Albatross* gives opportunity to examine the mouth parts and cirri.

The mandible (Plate IV, fig. 4) has six larger teeth, counting the blunt lower point, and two smaller ones. The lower point is covered with minute spines.

The maxilla (Plate IV, fig. 5) has a sinuous edge, closely set with spines. There is a tuft of delicate hairs on the upper border.

The first pair of cirri (Plate IV, fig. 1) has very unequal rami, the anterior ramus shorter, with 12 segments greatly produced on their lateral borders. The posterior ramus consists of about 16 segments. The spines are chiefly seated on the distal borders of the segments. The inner face of the cirrus is very densely spinose all over.

The second pair of cirri is shorter than those following, with the endopod a trifle longer than the outer ramus. Externally they show a row of large spines along the anterior border, about five or six on each of the lower segments, the number decreasing to one on the distal ones. There are also groups of smaller spines at the sutures, along the posterior margins. The whole inner face of the cirrus is densely hairy.

On the sixth cirrus, along the anterior side of each ramus, there is a double series of long diverging spines, five spines on each joint. Between each pair of large spines there is a group of small ones.

Near the ends of the cirri the spines decrease in number, so that finally there are only one or two pairs on each joint. Near the base the joints are much shorter than in the middle, and bear four pairs of shorter spines. At the posterior margin of the cirrus, a small group of two to four short spines springs from the distal end of each joint. Plate IV, fig. 3, shows the arrangement of spines on a middle joint of the sixth cirrus. The outer and inner faces of the cirri are alike, the latter not hairy, and the two rami are of nearly the same length, composed of about 45 joints.

The terminal appendage (Plate IV, fig. 2) is very small, only about 2 mm. long, and composed of six joints. It terminates in a few long bristles.

Scalpellum inerme Annandale,[a] from Bali Straits, 160 fathoms, is clearly a derivative from the *S. stearnsii* stock, divergent in the degeneration of the valves. The broad joints of the anterior branch of the first cirrus resemble those of *S. stearnsii*, but according to Annandale's figure, there are fewer joints. The caudal appendages are decidedly more developed in *S. inerme*. The mandible has numerous teeth, as in *S. stearnsii*.

SCALPELLUM SCALPELLUM (Linnæus).

1767. *Lepas scalpellum* Linnæus, Systema naturæ, 12th ed., p. 1109.
1824. *Scalpellum vulgare* Leach and of authors.

Localities.—Cat. No. 12186, 32873, Shetland Islands, Jeffreys collection. No. 12173, Unst, Shetland Islands, 85 fathoms, Jeffreys collection. No. 12181, Swansea Bay, Wales, Jeffreys collection. No. 12174, Plymouth (Bate), Jeffreys collection. No. 12175, Exmouth Beach, Jeffreys collection. No. 12171, 150 miles from Land's End, 200 fathoms (Sir John Anderson), Jeffreys collection. No. 23188, Naples, zoological station.

There are also several lots without locality data, but all apparently British. The series comprises some hundreds of examples, and was brought together by J. Gwyn Jeffreys, the well-known conchologist. The use of the specific name *vulgare* by Leach, Darwin, and later authors, was in order to avoid tautonomy, but changes on this account are now considered inadmissible, and I therefore revert to the Linnean name.

Abundant as this species is in the seas of northern Europe, it has not been found on the American side.

[a] Annandale, Malaysian Barnacles in the Indian Museum, Mem. Asiatic Soc. of Bengal, I, No. 5, p. 75, 1905, pl. VIII, figs. 1, 1*a*.

SCALPELLUM GIBBUM, new species.

Type.—Cat. No. 10060, U. S. N. M.

Type-locality.—*Albatross* Station 2388. Gulf of Mexico. North latitude 29° 24′ 30″, west longitude 88° 01′, 35 fathoms.

The capitulum is subtriangular, the ventral margin straight, the dorsal (carinal) margin angularly bent in the middle; composed of 14 fully calcified plates, separated by rather narrow chitinous sutures; covered with a thin, rather sparsely hairy cuticle. The plates are very lightly marked with growth lines.

The scutum is more than twice as long as wide, with the umbo slightly prominent, at the upper third of the occludent margin. The tergal margin is very oblique; the lateral margin is angular below its middle, the basal margin slightly concave.

The tergum is very much longer than the scutum, narrowly triangular. The occludent margin is slightly convex, becoming abruptly and very strongly recurved at the summit. The scutal margin is nearly straight. The carinal margin is composed of two concave curves, a very short one above the summit of the carina and a much longer curve below it.

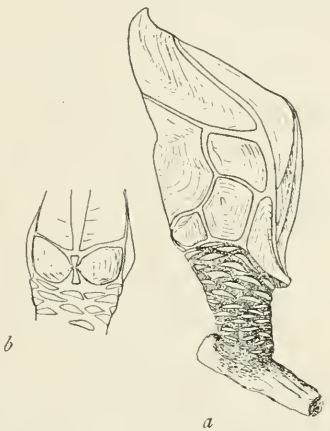


FIG. 4.—SCALPELLUM GIBBUM. *a*, LATERAL VIEW ×4½; *b*, DETAIL OF ROSTRUM.

The carina is very prominently angular near the middle, the dorsal outline straight above the angle, a little convex below it. The roof is convex, but bounded by low lateral ribs, accompanied at a little distance by a second arcuate rib on each side. The sides are wide and flat, marked with four or five wrinkles parallel to lines of growth. The umbo is close above the dorsal angle of the valve. The upper end of the carina is above the upper third of the carinal margin of the tergum.

The upper latus is rhomboidal, the scutal and carinal margins convex, the tergal margin straight, and the basal margin concave. The umbo lies near the scutal margin, about midway between the basal and tergal borders.

The rostrum is narrow, parallel-sided, the beaks of the rostral latera meeting over it above the middle. The rostral latus is shaped like the brachiopod *Lingula;* twice as long as high. Umbo acute. Upper and basal margins are parallel, the lateral margin straight.

The inframedian latus is convex, pentagonal, very much larger than the other plates of the lower whorl, and fully equal to the upper latus in area. Its basal and rostral margins are shorter than the others,

and about equal. The scutal, upper, and carinal borders are successively longer, the latter nearly twice as long as the rostral. The umbo is nearly central.

The carinal latus is claw-shaped, the umbo projecting below the carina. The basal and lateral margins are about equal, the upper margin very short, the carinal margin concave, with a low, submarginal rib.

The peduncle is covered with large imbricating scales, in about 10 rows.

Length of the capitulum 7, breadth 4 mm. Length of the peduncle 2 mm. (Fig. 4.)

This very distinct little barnacle is related to *S. scalpellum*, yet differs in many respects. The capitulum is strongly contracted toward the base, while in *S. scalpellum* the dorsal and ventral margins are nearly parallel there. The inframedian latus is larger in *S. gibbum*, with a subcentral, instead of subbasal, mucro. The carinal latus is comparatively longer and narrower than in *S. scalpellum*, and the rostrum is narrower. Finally, the carina is more strongly sculptured than in *S. scalpellum*.

S. gibberum Aurivillius, from off the Rio de La Plata, differs by its smaller rostrum, basal umbo of the inframedian lateral plate and other characters.

SCALPELLUM PATAGONICUM Gruvel.

1900. *S. patagonicum* Gruvel, Bull. du Mus. d'hist. nat. Paris, 1900, p. 188; Archives du Muséum, 4e sér., IV, 1902, p. 236, pl. XII, fig. 1A, 16 (coast of Patagonia).

Localities.—Cat. No. 32918, U.S.N.M., Straits of Magellan, *Albatross* Station 2775, in 29.5 fathoms, seated mainly on *Mytilus* shells. Station 2776, south latitude 52° 41′, west longitude 69° 55′ 30″, in 21 fathoms. Station 2773, south latitude 52° 23′, west longitude 68° 11′, in 10 fathoms. No. 32917, U.S.N.M., off the east coast of Patagonia. Station 2767, south latitude 48° 03′, west longitude 58° 56′, in 52 fathoms. Station 2758, south latitude 42° 24′, west longitude 61° 38′ 30″, off the Bay of San Matias, Patagonia.

Abundant series were taken at Stations 2775 and 2767. In the young and half-grown individuals the chitinous spaces between the plates are much reduced, such examples then resembling *S. scalpellum* (Linnæus). At Station 2775 the typical form occurs, with the capitulum 10 to 12 mm. long, and the umbo of the inframedian lateral plate more or less protuberant. Similar individuals were taken at Stations 2776 and 2773. The largest from the latter station measure 16 mm. long.

At Station 2767, off the east coast of Patagonia, they grow larger, the capitulum reaching a length of 18 to 20, peduncle 16 to 20 mm. long, and the umbo of the inframedian lateral is usually flattened. A single individual from Station 2758, farther north, has the umbo similarly flattened.

S. patagonicum is remarkable for the imperfect calcification of the valves in the adult stage. In other respects it resembles *S. scalpellum*.

GROUP OF SCALPELLUM CALIFORNICUM.

SCALPELLUM CALIFORNICUM Pilsbry.

1907. *Scalpellum californicum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 196, pl. vi, figs. 8, 13.

Type.—Cat. No. 32811, U.S.N.M.

Locality.—Vicinity of Monterey Bay, California, in 40 to 86 fathoms.

SCALPELLUM OSSEUM Pilsbry.

1907. *Scalpellum californicum osseum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 196, pl. vi, fig. 7.

Type.—Cat. No. 32413, U.S.N.M.

Type-locality.—*Albatross* Station 4454, off Point Pinos Light, 71 fathoms.

Other localities.—No. 32910, U.S.N.M., *Albatross* Station 2906, off southern California, north latitude 34° 23′ 30″, west longitude 120° 19′ 30″, in 96 fathoms, bottom temperature 55.5°.

The capitulum is oblong-rhombic, with the occludent border straight or nearly so; dorsal border moderately convex; upper border oblique and a little concave. It is composed of 14 fully calcified valves, joined by narrow sutures, covered with a thin cuticle, sparsely hairy on the sides, more profusely so dorsally. The valves are weakly sculptured with widely spaced wrinkles along lines of growth.

The scutum is half the total length of the capitulum, and fully twice as long as wide, with parallel occludent and lateral margins and acute, erect, apex, which does not project from the occludent outline. The umbo is removed a short distance from the apex. The basal margin is oblique and straight. The occludent half of the plate shows some very inconspicuous radial striæ.

The tergum is triangular, nearly 1½ times the length of the scuta. The occludent and scutal margins are straight, the carinal margin a little irregular or convex; apex erect.

The carina is weakly curved, with apical umbo. The roof is convex, quite wide toward the base, and bounded by low ribs. The sides are well developed, divided into two areas by a low curved riblet which defines the division into intraparietal and parietal portions.

The upper lateral plate is subrhombic, the scutal and tergal margins straight and about equal, the basal margin decidedly shorter, the baso-carinal extremity rounded. The umbo is not quite terminal.

The rostrum is small but well developed, in shape an isosceles triangle. The rostral latus is transversely elongate, about twice as long as wide, a little narrower ventrally, and divided by a low rib from the apex to the baso-lateral angle. The inframedian latus is pentagonal, a little longer than wide, with the umbo at the upper rostral third.

The carinal latus is irregularly triangular, higher than wide, with the umbo at the lower fourth, at the baso-lateral angle of the carina.

The peduncle has about 19 rows of about 13 scales each. It is hirsute like the capitulum, and varies a good deal in length.

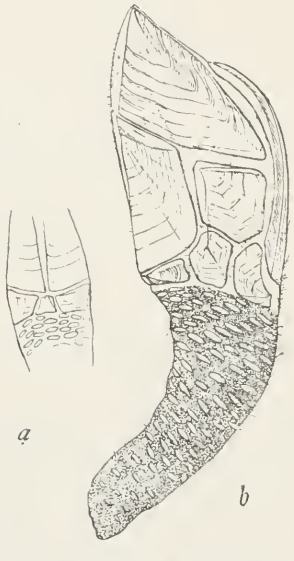


FIG. 5.—SCALPELLUM OSSEUM. *a*, LATERAL VIEW × 3; *b*, DETAIL OF ROSTRUM.

Length of the capitulum 12.5, breadth 7 mm. Length of the peduncle 10 mm. Length of the carina 10, diameter at base 1.6 mm. (Fig. 5.)

The figure and description are from one of a group of six individuals from Station 2906, most of them with the peduncle much shorter—6 or 7 mm. long. When I described this form as a subspecies of *S. californicum* I had only some young individuals less than half the size of those now before me. The larger examples show that with increased size the valves remain strongly calcified to their borders, differing from *S. californicum* of equal size, in which the valves are but weakly calcified, their edges chitinous. These constant differences in the considerable series of both forms now before me seem to indicate that *S. osseum* is a distinct species, though closely related to *S. californicum*. A full description of the adult form of *S. osseum* is given above to supplement my former account of the young stage.

The two species, *californicum* and *osseum*, are related to the group of *S. scalpellum* rather than to that of *S. stroemii*, having the characteristic low rostral latera and short rostrum of the former group.

GROUP OF SCALPELLUM STROEMII.

S. stroemii is the senior name of a series of small North Atlantic and Arctic forms, distinguished by the large pentagonal inframedian latus with the umbo at or below the middle of its rostral border, a long and narrow or triangular but well-developed rostrum, the rostral latus about as high as wide, subtriangular or quadrangu-

lar, and generally the umbo of the carina is removed more or less from the apex. The named forms are as follows:

S. stroemii M. Sars.
S. obesum Aurivillius.
S. luridum Aurivillius.
S. aduncum Aurivillius.
S. groenlandicum Aurivillius.
S. cornutum Sars.
S. angustum G. O. Sars.
S. nymphocola Hoek.
S. septentrionale Aurivillius.

Of these forms, *S. angustum* and *S. nymphocola* are distinct by the quite apical umbo of the carina and the acute terga. *S. cornutum* differs from the others by the position of the umbo of the inframedian latus, among other features. In *S. groenlandicum* the umbo of the carina, while not quite terminal, does not project, and the rostrum is wider above than below.

All of the other forms (*S. stroemii* Sars, *septentrionale*, *obesum*, *luridum*, and *aduncum* Aurivillius) have the carina angular, the rostrum tapering upward, and the umbo of the inframedian latus at or below the middle of the rostral margin. It seems to me very doubtful whether the several forms of this type can be distinguished as species. Their slight differences are apparently due in part to age, but chiefly represent, I think, local and colonial variations of *S. stroemii*,[a] a species in which nearly every colony brought up by the dredge has its own slight peculiarities.

The degree to which the basal whorl of plates is swollen varies with age. Figures 1 to 5 on Plate I represent three individuals from one cluster, drawn to the same scale, and selected from a continuous series of variations in obesity, to illustrate this point, the old, obese examples having ovaries swollen with eggs.

SCALPELLUM STROEMII M. Sars.

Plate I, figs. 6, 7 (typical), and figs. 1–5 (variety).

1859. *S. stroemii* M. Sars, Forhandlinger Videnskabs-Selskabet i Christiania, Aar 1858, p. 158, (Finmark, 40–50 fms.).
1891. *S. stroemii* G. O. Sars, Forh. Videnskabs-Selsk. Aar 1890, p. 77.

This species has been variously identified by Verrill, Hoek, and Gruvel. On application to Prof. G. O. Sars I received two specimens.

[a] Hoek's figure of *S. stroemii* (Challenger Report, Cirripedia, pl. III, fig. 6) is evidently erroneous in the shading of the inframedian and upper latera, giving the impression that these plates have subcentral umbones; also in the position of the umbo of the scutum. The upper latus is figured as nearly three times as long as wide, a proportion unlike any form of the group known to me. The specimen requires reexamination.

which he writes "may be regarded as typical." One of these is figured. (Plate I, figs. 6, 7.)

The plates have sculpture of indistinct growth-lines and radial striæ. The umbo of the carina is at the upper fifth of the length of the plate, measured along the curve. The rostrum is wedge-shaped as high as the rostral latera. The latter are triangular, and project at the umbones. The inframedian latus is wide, the width more than half the length, with umbo median on the rostral border. The carinal latus projects somewhat beyond the base of the carina. The scales, which compactly cover the peduncle, are in 8 rows. The basal whorl of plates is only slightly swollen. The capitulum of the specimen figured measures 6.8 mm. long.

A form of *S. stroemii*, shown in figs. 1 to 5, from St. Peters Bank, No. 21547, U.S.N.M., differs by the higher rostral latera, the other plates remaining nearly of the typical shape. In most of this lot the umbo of the inframedian lateral plate is submedian on the rostral border, but other individuals have it lower, and in the most extreme it is at the lower third of the rostral border of the plate, as in *S. stroemii substroemii*.

Specimens of this form, with others between it and typical *S. stroemii* were taken also at the following Fish Commission stations: 2528, off Marthas Vineyard; 2068; also Cat. No. 21548, U.S.N.M., from Gloucester fishermen, and therefore from the fishing banks.

SCALPELLUM STROEMII SUBSTROEMII, new subspecies.

Plate I, figs. 8, 9, 10.

Type.—Cat. No. 11756, U.S.N.M.

Type-locality.—*Albatross* Station 2693, off Newfoundland, in 78 fathoms.

Other localities.—*Albatross* Station 2062, off New England, north latitude 42° 17′, west longitude 66° 37′ 15″, in 150 fathoms, No. 11325, U.S.N.M.; also at Station 2067, and at trawl station 10, H. M. S. *Triton*, Faroe Channel, in 516 fathoms, No. 12203, U.S.N.M., Jeffreys collection.

The rostrum and rostral latera are shaped about as in *S. stroemii*, but the inframedian lateral plate is wider, with the umbo below the lower third of its rostral border. The carina is broader than in *S. stroemii*, with a wider intraparietal area. The type, No. 11756, measures, length of capitulum 10, width 5, diam. 3 mm.

This form is apparently identical with *S. strœmii* of Gruvel.[a]

[a] Monographie des Cirrhipèdes, p. 41, No. 21, fig. 42.

SCALPELLUM STROEMII LATIROSTRUM, new subspecies.

Plate I, figs. 11, 12, 13, 14.

Type.—No. 10780, U.S.N.M.

Type-locality.—*Albatross* Station 2527, north latitude 41° 59′, west longitude 65° 35′ 30″, southeast border of Georges Bank, in 117 fathoms.

The rostrum is triangular, much broader at the base than in any other known form of the *stroemii* group. Rostral latera about as in *S. stroemii*. Inframedian lateral plate generally short and wide, with the umbo at the lower third or slightly below the middle of the rostral margin. Roof of the carina flattened, with more or less distinct bordering ribs. Length of capitulum 11, width 6, diam. 4 mm.

This form has the capitulum swollen laterally at the lower whorl of plates, and is distinguished by the very wide rostral plate.

Plate I, figs. 15, 16, represent a form somewhat intermediate between *latirostrum* and *substroemii* in the shape of the rostrum. The figures are drawn from No. 9020, U.S.N.M.

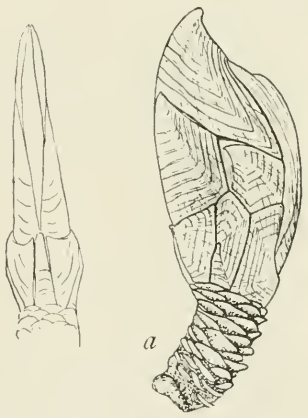


FIG. 6.—SCALPELLUM PRESSUM. *a*, VENTRAL VIEW; *b*, LATERAL VIEW. ×5.

SCALPELLUM PRESSUM, new species.

Type.—No. 32903, U.S.N.M.

Type-locality.—Le Have Bank, 300 fathoms, Captain Johnson donor.

Other localities.—Nos. 9027, 9024, U. S. Fish Commission, Station 1124, off Marthas Vineyard. No. 32904, *Albatross* Station 2668, north latitude 30° 58′ 30″, west longitude 79° 38′ 30″, off Fernandina, Florida, 294 fathoms. No. 10778, *Albatross* Station 2470, off Nova Scotia, 224 fathoms. No. 32905, *Albatross* Station 2527, off Georges Bank.

The capitulum is compressed, widest above the middle, tapering toward the base which is quite narrow; composed of 14 plates, which are irregularly marked with concentric wrinkles and a few weak radial striæ. The occludent border is convex, chiefly so in its upper half.

The scutum is about twice as long as wide, the occludent border but slightly convex. The oblique basal margin is a little shorter than the lateral.

The tergum has a convex occludent margin. The apex is recurved. The carinal margin is a little concave above the carina, straight where in contact with it.

The carina is moderately arcuate, with the umbo projecting a little, near the apex. The roof is convex, and shows a few weak longitudinal striæ at the sides. The sides (parietes) are rather narrow; the intraparietes are somewhat wider.

The upper lateral plate is larger than in related species, pentagonal. The carinal and two lower facets are subequal. The scutal margin is about twice as long as the basal, and the tergal margin is slightly longer than the scutal. The umbo is not quite terminal.

The rostrum is very long, narrowly wedge-shaped, slightly enlarged at the projecting apex.

The rostral latus is triangular, a trifle longer than wide. The rostral margin is slightly convex, the lateral margin slightly sinuous, the scutal margin somewhat concave.

The inframedian latus is more than twice as high as wide, with the umbo on the rostral margin below the middle. The scutal margin is slightly shorter than that against the upper latus. The carinal margin is nearly straight.

The carinal lateral plate is about twice as high as wide. The umbo projects slightly behind the base of the carina. Below it there is a nearly straight margin almost as long as the basal margin and about one-third the length of the plate. The upper margin is oblique. The dorsal margins of the two carinal latera meet below the umbones in a straight suture.

The peduncle is about one-third to one-half the length of the capitulum. It tapers to the base and is covered with 8 rows of rather large imbricating scales, 8 to 10 scales in a row.

Length of the capitulum 8, breadth 4, greatest diameter 1.8 mm. Length of the peduncle 3 mm.

This species, which seems to be somewhat abundant off our northeastern coast, resembles the form which Aurivillius has called *S. septentrionale*. It differs from that, however, by the narrower base of the capitulum, the greater compression, and the position of the umbo of the carina, which is much nearer the apex. The inframedian lateral plate is longer than in any of the related forms, and the rostrum has the long and narrow shape figured by Aurivillius for *S. septentrionale* and *S. obesum*. The capitulum of *S. pressum* is more lengthened than that of *S. stroemii*, chiefly by reason of the elongation of the plates of the lower whorl.

Besides the lots mentioned above, there are several others without exact localities, donated by Gloucester fishermen. This barnacle is often seated on the egg capsules of rays or sharks. (Fig. 6.)

SCALPELLUM ANGUSTUM Sars.

Locality.—Cat. No. 17266, U.S.N.M. Kara Sea. Dijmphna expedition 1882–83.

Distinct from *S. pressum* by the terminal umbo of the carina, the higher position of the umbo of the carinal lateral plate, and the parallel-sided rostrum. The tergum in these specimens does not project so far upward as in Gruvel's figures.

Section IV. HOLOSCALPELLUM, new section..

Rostral latus wide and low, its width usually double the height, with long subparallel basal and scutal borders; inframedian latus smaller than the rostral latus; rostrum small or wanting; carina with the umbo apical or near the apex; plates 13 or 14. Type, S. velutinum.

A large natural group of almost exclusively deep-sea species, widely distributed in both Atlantic and Pacific waters. Besides the species considered below, the following belong here: *S. darwini*, *S. gigas*, *S. moluccanum*, *S. rubrum*, *S. antarcticum*, *S. hirsutum*, *S. indicum*, *S. pedunculatum*, *S. sociabile*, *S. alcockianum*, and probably some others.

The complemental males are sack-like, with no division into capitulum and peduncle, and have excessively minute valves or none.

KEY TO SPECIES.

a. Carinal latus much wider than high; umbo recurved, near the upper margin. Species of large size.

b. Plates in contact; carina very broad at base, breadth ¼ to ⅓ the length, roof flat or concave between raised lateral borders.....*S. velutinum.*

bb. Plates separated by wide chitinous sutures.

c. Carina rounded dorsally; valves covered with a thick cuticle; umbo of carinal latus not projecting.....*S. giganteum.*

cc. Carina with flattened roof bounded by angles, and narrow throughout; umbo of carinal latus projecting laterally.....*S. regina.*

aa. Carinal latus about as high as wide, the umbo apical; inframedian latus wider than high. Large species.

b. Roof of the carina slightly convex, angular at the sides.....*S. regium.*

bb. Roof flat with bordering ribs; inframedian latus larger...*S. regium latidorsum.*

aa. Carinal latus about as high as wide, the umbo projecting directly backward beyond the carina; inframedian latus narrow, hooked forward; umbo of carina at the middle of carinal margin of tergum. Small, violet-tinted.

S. gorgoniophilum.

aaaa. Carinal latus about as high as wide, the umbo recurved, at or below the middle of its carinal border. Small species.

b. Inframedian latus narrow and high, oblong or tapering upward, without conspicuously produced angles.

c. Upper end of inframedian latus rather acute. Atlantic.

d. Capitulum not tapering toward the base; apex of inframedian latus curved toward the scutum.

e. Umbo of carinal latus about median on the carinal border.

S. portoricanum intonsum.

ee. Umbo of carinal latus at the lower third of the carinal border. *S. portoricanum.*

dd. Capitulum widest in the middle, tapering to the base; inframedian latus erect ..... *S. longicarinatum.*

cc. Upper end of the inframedian latus obtuse or truncate. Pacific species.

d. Rostrum present ..... *S. sanctipetrense.*

dd. Rostrum wanting.

e. Plates fully calcified; umbo of inframedian latus subapical. *S. gruvelianum.*

ee. Plates separated by wide chitinous sutures; umbo of inframedian latus submedian ..... *S. gruvelianum secundum.*

bb. Inframedian latus of very irregular shape, its upper carinal angle produced; roof of carina deeply guttered.

c. Scales of the peduncle minute, 0.2 to 0.3 mm. wide; scutum and upper latus radially striate; carina narrow. East coast of Patagonia ..... *S. rathbunæ.*

cc. Scales of the peduncle about 1 mm. wide; scutum and upper latus not radially striate; carina wider. Galapagos ..... *S. soror.*

aaaa. Carinal latus subtriangular, its narrower umbonal half free, projecting downward below the carina, umbo terminal.

b. Carina with wide intraparietes, the umbo not apical; inframedian latus oblong-pentagonal, the umbo not apical. Gulf of Mexico ..... *S. arietinum.*

bb. Carina with narrow sides throughout, the umbo terminal; inframedian latus triangular, with the apex curved toward the scutum, umbo apical. *S. diceratum.*

GROUP OF SCALPELLUM VELUTINUM.

The carinal latus has a recurved umbo, either apical or near the upper border of the plate; the triangular inframedian latus is wider than high; the capitulum is more or less thickly clothed with a velvety cuticle. Large or very large forms.

This group comprises most of the largest species of the genus known.

SCALPELLUM VELUTINUM Hoek.

Plate III, fig. 2, 3.

1883. *Scalpellum velutinum* Hoek, Challenger Rep., Cirripedia, p. 96, pl. iv, figs. 10, 11. Off Cape St. Vincent, 900 fathoms, and off Tristan da Cunha 1,425 fathoms.—Gruvel, Expéd. Sci. du Travailleur et du Talisman, Cirrhipèdes, 1902, pp. 56, 136, pl. iii, fig. 1; pl. xi, fig. 3*c*. Off Cape Cantin, Cape Mogador, Fuereventure and Pilones, in 882 to 2,000 meters.

1883. *Scalpellum eximium* Hoek, Challenger Rep., Cirripedia, p. 100, pl. iv, figs. 6, 7. Off Tristan da Cunha, 1,000 fathoms.

1898. *Scalpellum sordidum* Aurivillius, Bull. Soc. Zool. de France, XXIII, p. 190.

1902. *Scalpellum alatum* Gruvel, in Expéd. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 57.

Localities in the western Atlantic.

Museum No.	Station No.	Locality. North latitude.			Locality. West longitude.			Depth.	Collector, etc.
		°	′	″	°	′	″	*Fathoms.*	
3765	.....	43	34	00	49	00	00	.....	Capt. F. F. Hodgdon.
10766	2429	42	55	30	50	51	00	471	*Albatross.* Off Newfoundland.
12480	.....	42	48	00	63	07	00	35	Capt. Jos. W. Collins, 1878.
3174	.....	42	44	00	65	54	00	350–400	Unknown.
4107	.....	42	40	00	63	06	00	.....	Capt. Jerome McDonald.
4108	.....	Le Have Bank.						160	Capt. Daniel McKinnon.
8969	.....								
10757	2528	41	47	00	65	67	30	677	*Albatross.* Bottom temperature, 38.7°.
10760									
9025	1122	40	02	00	68	50	00	351	U. S. F. C. Off Marthas Vineyard.
9056	1124	40	01	00	68	54	00	640	Do.
10759	2554	39	48	30	70	40	30	445	*Albatross.* Bottom temperature, 39.6°.
9010	2205	39	35	00	71	18	45	1,073	*Albatross.* Bottom temperature, 38.1°.
32896									
9037	2231	38	29	00	73	09	00	965	*Albatross.* Bottom temperature, 36.8°.
12892	2742	37	46	30	73	56	30	865	*Albatross.* Bottom temperature, 38°.
12890	2739	37	34	30	73	58	00	811	*Albatross.* Bottom temperature, 38.2°.
12283	2731	36	45	00	74	30	00	781	*Albatross.*
12285	2730	36	42	00	74	30	00	727	Do.
11532	2678	32	40	00	76	40	30	731	Do.

This magnificent species may be recognized by the characteristic shape of the carina, which has a flat roof with bordering flanges and a squarely truncate base, not triangularly entering between the carinal latera, as in the allied large species. The roof is much wider basally than in other related species, its width there varying from one-fourth to over a third of the whole length of the carina.

The largest individual before me measures: Length of capitulum 56, breadth 38 mm.; length of peduncle 36 mm., carina 50 mm. long, with a basal diameter of 18 mm. It is from the Great Banks of Newfoundland.

The group figured is part of No. 12480, U.S.N.M., taken on the fishing banks in 35 fathoms.

S. velutinum has a wide range on both sides of the Atlantic. It was taken by the *Challenger* at two stations near Tristan da Cunha, but all other records are from north of the equator. It seems to extend farther north on the American than on the European side. In our waters it has been found from about the latitude of Charleston, South Carolina, to above that of Boston, 32° 40′ to 43° 34′ north latitude, in depths of from 35 to over 1,000 fathoms, the bottom temperature ranging from 36.8° to 39.6°. It is common on the fishing banks, and is frequently brought up on the lines of the Gloucester fishermen.

S. velutinum has been reported by Dr. Annandale from the Gulf of Oman, in 430 fathoms. *Scalpellum formæ* Alessandri, of the Italian miocene, is closely related to *S. velutinum*.

SCALPELLUM REGIUM Wyville Thomson.

Plate III, figs. 4, 5.

1877. *Scalpellum regium* Wyville Thomson, The Voyage of the Challenger. The Atlantic, II, p. 4, fig. 2 (♀) and p. 7, fig. 3 (♂)—Hoek, Challenger Report, VIII, Cirripedia, p. 106, pl. IV, figs. 3–5 (type-locality, north latitude 34° 54′, west longitude 56° 38′, 2,850 fathoms; also 35° 29′, 50° 53′, 2,750 fathoms).

Locality.—Cat. No. 8629, U.S.N.M., *Albatross* Station 2226, east of the mouth of Chesapeake Bay, north latitude 37°, west longitude 71° 54′, 2,045 fathoms, Globigerina ooze. Seated on a slender gorgonian stem and on a pebble.

This is the first record of this species in the west Atlantic.

The specimens on a gorgonian stem (Plate III, fig. 4) have a thin, smooth cuticle, nowhere visibly hairy, though velvety to the touch, and the plates of the basal whorl are somewhat higher than in the figured type of *S. regium*. Plate II, fig. 8, represents a transverse section of the carina. Length of capitulum 39; of peduncle 20 mm. The rostrum is lanceolate-linear, extending up between the umbones of the rostral latera.

Another specimen, attached to a pebble (Plate III, fig. 5), is covered with a densely pilose cuticle, the pile longer on the peduncle. The plates are as figured for typical *S. regium*. The two carinal latera are in contact only near the base, for a space of 2.5 mm., while in the other specimen they are in contact for 7 mm. The rostrum is narrowly lanceolate, the rostral latera meeting above it. Length of capitulum 35; of peduncle 23 mm.

The cirri of one of the examples from Station 2226 agree in essential respects with Hoek's description. The branches of the first pair have 8 and 12 segments, those of the anterior ramus being produced laterally. Cirrus ii has 26 segments in each ramus. The other cirri are longer and equal. The caudal appendage (Plate IV, fig. 8) consists of 6 segments, spiny at the articulations, terminating in a pencil of long spines. The penis is very long, and its distal half is quite slender. In Hoek's example there were 4 segments in the caudal appendage, and no penis.

The mandible (Plate IV, figs. 6, 7) has four teeth, including the lower angle. The space between the upper and second teeth is double that separating the other teeth. The basal tooth or angle is shortly and closely spinose at the edge (fig. 7). The maxilla has a single large spine at the upper angle, the rest of the face being evenly spinose. The edge recedes a little under the large spine. The upper border is shortly hairy.

Three quite young examples are before me, clearly referable to *S. regium* or perhaps to the following subspecies, the smallest with the capitulum 8, the largest 10 mm. long. The inframedian latus is narrower and higher than in adult *regium*, with the apex curved

toward the ventral border. The rostrum is decidedly better developed than in adults. It is oblong and parallel-sided, with truncate apex in the larger examples, but is wider near the apex and tapers downward in the smallest specimen. The scutum is somewhat narrower than in adult *regium*. These young specimens are from the following stations:

Cat. No. 10782, *Albatross* Station 2575, north latitude 41° 07′, west longitude 65° 26′ 30″, in 1,710 fathoms; temperature, 37.1° F. No. 10781, *Albatross* Station 2533, north latitude 40° 16′ 30″, west longitude 67° 26′ 15″, in 828 fathoms; temperature, 38.7° F. No. 8637, *Albatross* Station 2228, north latitude 37° 25′, west longitude 73° 06′, in 1,582 fathoms; temperature, 36.8° F.

SCALPELLUM REGIUM LATIDORSUM, new subspecies.

Plate II, figs. 2, 3, 7. Plate IV, figs. 10, 11, 12, 14.

Type.—Cat. No. 8632, U.S.N.M.

Type-locality.—*Albatross* Station 2222, north latitude 39° 03′, west longitude 70° 51′, 1,537 fathoms.

Other localities.—No. 9058, Station 2042, north latitude 39° 33′, west longitude 68° 27′, 1,555 fathoms. No. 9057, Station 2041, north latitude 39° 23′, west longitude 68° 25′, 1,608 fathoms. Station 2210, north latitude 39° 37′ 45″, west longitude 71° 18′ 45″, 991 fathoms.

The capitulum resembles that of *S. regium* in shape and the general arrangement of the plates. It differs by the larger size of the inframedian latera, and by the shape of the carina, which has a flat roof bordered by rounded ridges (as shown in Plate II, fig. 7, a diagram of the carina in transverse section). It is wider than the carina of *S. regium*. A small triangular chitinous appendage extends upward beyond the umbo of the carinal latus. The thin cuticle is quite sparsely hairy.

Length of the capitulum, 40, of peduncle 19, mm.; length of carina 38; diameter at base 9 mm.

This form was taken only at several adjacent stations southeast from Nantucket. A series of about a dozen specimens was examined, the capitula from 11 to 40 mm. long.

In those from Station 2042 the inframedian latera are higher than wide, with the apices curving slightly toward the scuta. In the specimens from Station 2041 the apices are more strongly curved.

A form closely related to *S. r. latidorsum*, said to be from a Pacific station, represented by a series of over a dozen examples, may be described here. (Plate II, figs. 9, 10, natural size.) It is No. 32916, U.S.N.M., from *Albatross* Station 3342, north latitude 52° 39′ 30″, west longitude 132° 38′, off British Columbia, in 1,588 fathoms. This form differs from *S. regium latidorsum* chiefly by the narrower roof of the carina and the larger chitinous appendages above the

umbones of carinal and inframedian latera. The capitulum is covered with a rather thin yellowish-gray cuticle, which is very shortly and delicately pilose, the pile hardly noticeable, and worn from the older portions of the valves. The scutum is like that of *S. regium*, except that the upper part is less acuminate. The carina is flat on the roof, angular or with low ribs laterally, the sides spreading a little. The base and growth lines are V-shaped, as in *regium*. The roof is not so wide as in *S. regium latidorsum*. The upper latus is like that of *S. regium*, except that its carinal border is longer. The rostrum is narrow and indistinctly visible through the cuticle. Rostrallatus is decidedly lower in comparison with its width than in *S. regium*. The triangular inframedian latus is much smaller, relatively to the size of the capitulum, than in *S. regium*, and there is a roof-like chitinous extension above its apex not noticed in *S. regium*. The carinal latera are comparatively lower than in *regium*, with a strongly recurved umbo, above which there is a chitinous extension of the plate, which extends also along the upper margin. The peduncle has larger scales than in *S. regium*, and is less pubescent. There are 7 rows of about 9 scales each.

Length of capitulum, 48; breadth, 31; length of carina, 43; diameter near base, 9.5 mm.; length of peduncle 21 mm.

The largest specimen of the lot measures—length of capitulum 60, breadth 38, length of peduncle 36 mm. It is one of the largest species of the genus.

The cirri (of the largest specimen seen) are dark brown, the first pair blackish. Branches of the first cirrus (Plate IV, fig. 10) unequal, with 11 and 13 segments, those of the anterior branch very short and broad, wider than in *S. regium*. Cirrus ii is shorter than the following, with subequal branches of about 26 segments. The other cirri are somewhat longer and subequal. The joints of the sixth cirrus have 5 or 6 pairs of long bristles along the anterior margin, with numerous fine short bristles between the major ones of each pair. The arrangement is not unlike that figured for *S. stearnsii*, except that there are more small bristles. The caudal appendage consists of 5 indistinct segments, each with a bunch of bristles, the last terminating in a group of long spines (Plate IV, fig. 14). The individual examined had no penis.

The mandible (Plate IV, fig. 12) has four teeth, the lower one very bluntly truncate, the spaces between the teeth being subequal, not unequal, as in the example of *S. regium* examined. The maxilla has a single large upper spine and a straight, closely spinose edge (Plate IV, fig. 11).

A young example has pale, corneous cirri. Whether the differences between this form and *S. regium* found in the cirri and mandibles would prove constant in a large series remains to be seen.

Attached to one of the specimens I found the single example of *S. aurivillii incertum*. The occurrence in a Pacific station of two forms so closely related to Atlantic species as these may give rise to serious doubts as to the proper labeling of the material; yet I have been unable to obtain any information indicating that the barnacles were obtained elsewhere than at the station given.

SCALPELLUM REGINA, new species.

Plate II, figs. 4, 5, 6.

Type.—Cat. No. 9647, U.S.N.M.

Type-locality.—*Albatross* Station 2376, Gulf of Mexico, north latitude 29° 03′, west longitude 88° 16′, in 324 fathoms; gray mud.

Capitulum of 14 plates, in general shape like *S. regium;* moderately compressed; covered with a densely and shortly pilose cuticle. In adult capitula the plates are separated by rather wide chitinous sutures, but in young ones they are in contact. The plates are weakly sculptured with widely spaced low wrinkles along the lines of growth, as in *S. giganteum*.

The scutum is large, twice as long as wide. The occludent margin is arcuate above, the acuminate apex being somewhat recurved. Basal and lateral margins straight, tergal margin a little concave.

The tergum is about equal to the scutum in area and decidedly longer. Occludent margin straight, the carinal and scutal margins about equally arcuate. It is divided into two areas by a straight apicobasal ridge, the carinal area being about half as wide as the scutal. The greatest width of the tergum is less than half its length.

The carina is separated from the scuta and latera by a rather wide chitinous space. It is regularly arcuate or more curved above. Umbo terminal at the apex, which is pushed slightly between the scuta. The roof is slightly convex, bounded by angles but not ridges (Plate II, fig. 4, carina in transverse section). The sides are narrow throughout, and the base projects in a triangle between the carinal latera. The lines of growth on the roof are V-shaped.

The upper latus has the tergal and scutal margins straight, a little concave near the acuminate apex, the carinal and basal margins rounded. Umbo at the apex. It is sculptured with growth lines only.

The rostrum is very small, triangular, and separates the rostral latera slightly.

The rostral latus is low, with the upper and lower margins parallel.

The inframedian latus is small, triangular, with the basal margin longest, the umbo apical.

The carinal latus is of very irregular shape. The convex posterior margins project beyond the carina, and the two latera meet below it.

The umbo is elevated, acute, and curved toward the scutal margin. A prominent ridge runs from the umbo to the scutal end of the plate and two or three inconspicuous ridges to the basal margin.

The peduncle is equal to or shorter than the capitulum, covered with large scales and clothed with a velvety cuticle. There are 10 rows of about a dozen scales each in the figured type, but old individuals have more.

Length of capitulum 43, breadth 30 mm.; length of peduncle about 26 mm. Length of the carina 40, diameter at base 6 mm.

This fine species stands between *S. regium* and *S. giganteum*. It differs from the former by the wider chitinous spaces at the sutures, the smaller inframedian and much lower carinal latera. It has not such wide chitinous sutures as *S. giganteum*, which, moreover, has a rounded carina, still lower carinal latera, and smaller scuta and terga.

S. michelottianum Seguenza, of the Italian Pliocene, is a related species.

The 16 specimens show but little variation, except in the number of scales on the peduncle, which increases with age, new longitudinal rows being interposed.

The two oldest individuals measure: Length of capitulum 46, breadth 33 mm. Peduncle 45 mm. long, with 13 rows of about 16 scales each. Length of capitulum 43, breadth 35 mm. Peduncle 40 mm. long, with 13 rows of about 18 scales each.

SCALPELLUM GIGANTEUM Gruvel.

Plates II and III, figs. 1.

1902. *S. giganteum* Gruvel, Trans. Linn. Soc. London, 2 ser., VIII, Zoology, p. 153, pl. xvii, figs. 1–8, 17; Monographie des Cirrhipèdes, p. 78, fig. 88 (coast of Cuba in 500 fathoms).

Localities.—Cat. No. 11524, U.S.N.M., *Albatross* Station 2658, east of Florida, north latitude 28° 21′, west longitude 78° 37′, in 514 fathoms. Also, *Albatross* Station 2554, north latitude 39° 48′ 30″, west longitude 70° 41′, in 455 fathoms, on *S. velutinum*.

Twelve individuals were taken, four of them young. One of the largest has a capitulum 45 mm. long, the peduncle of about the same length. Usually only the apices of the valves are denuded of the thick, dense, gray cuticle, which is very shortly and sparsely pilose, and conceals the contours of the plates. It has been removed in the example figured on Plate II, fig. 1, to show the shape of the calcified portions of the plates.

These specimens differ from Gruvel's types by the reduction of the rostral plate, which is represented by a small granule only, or is completely absent. This plate is said to be small and oval in the original description of *giganteum*. Moreover, the carina extends a little farther down, and the rostral latera are better developed than in the types of

giganteum. These differences do not seem sufficient to call for specific separation.

The rostrum, when very small and covered by the cuticle, is subject to considerable variation, as I have found in numerous species.

The roof of the carina is rounded, in section like the letter U. This differentiates the species from other large Atlantic forms. The wide chitinous spaces between the calcified portions of the valves is a further distinguishing feature.

The single young specimen from Station 2554 extends the range of this fine species far to the north, and one very large individual, No. 32911, U.S.N.M., taken by a Gloucester fisherman, with no more precise locality than "fishing banks," indicates that *S. giganteum* may range as far north as *S. velutinum*. This individual (Plate III, fig. 1), measures: Length of capitulum 47, breadth 35, diameter 20 mm., length of peduncle about 37 mm. The uncalcified boundaries of the plates are indicated by whitish lines in the chitinous spaces.

GROUP OF SCALPELLUM GORGONIOPHILUM.

SCALPELLUM GORGONIOPHILUM, new species.

Type.—Cat. No. 9883 U.S.N.M.

Type-locality.—*Albatross* Station No. 2338, off Habana, Cuba, north latitude 23° 10′ 40″, west longitude 82° 20′ 15″, in 189 fathoms, coral bottom, on a gorgonian.

The capitulum is rather wide at the base, the carinal and occludent margins subparallel in the lower two-thirds; cream-white, the plates of the upper whorl crimson-violet tinted toward their umbones; not hairy, and with no noticeable cuticle; sculptured with rather rude growth lines and fine, indistinct radial striæ, with a stronger diagonal rib on the scutum and on the upper latus.

The scutum is long and rather narrow, with slightly arched occludent margin; lateral margin straight, subparallel to the occludent; basal margin straight, at a right angle to the occludent. It is acuminate toward the acute apex. Umbo apical.

The tergum is very long and narrow, with erect apex. The lower margin is slightly convex.

The carina is very short, its curvature chiefly near the apex. The roof is convex and radially striate, with narrow ribs separating it from the sides. The sides are wide, separated from the intraparietes by a sharply elevated arcuate rib. The umbo is apical and situated at the middle of the carinal margins of the scuta.

The upper latus has a long, straight, scutal margin; tergal and carinal margins nearly equal; basal margin quite short and oblique, formed by contact with the carinal latus. The umbo is apical.

The rostrum is comparatively large, in shape of an isosceles triangle. The rostral latus is low and wide, its surface divided by a diagonal rib.

The inframedian latus is narrow, obliquely triangular, tapering to the apex, which curves toward the scutum and overlies its baso-lateral angle. The umbo is apical.

The carinal latus is pentagonal, curved like a scoop, with the apex projecting outward beyond the carina. Three subequal faces abut on the upper and inframedian latera and the peduncle, the upper margin being longest. Behind the carina the two latera meet only at the base.

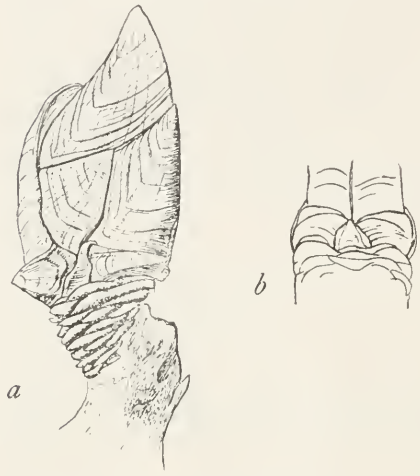


FIG. 7.—SCALPELLUM GORGONIOPHILUM. *a*, LATERAL VIEW; 4; *b*, DETAIL OF ROSTRUM.

The peduncle is stout and very short, very closely covered with projecting scales, in about 8 deeply interlocking rows of 6 or 7 scales each. It is inconspicuously hairy.

Length of the capitulum 9, breadth 5 mm.; length of the carina 6.8, diameter near the base 1.8 mm.; length of the peduncle about 2.8 mm.

This peculiar little species is represented by one example only, but it is so unlike any described form that I do not hesitate to describe it. The large size of the rostrum for a species of this group, the curious shape of the carinal latera, the short carina, and the color are its main characteristics. (Fig. 7.)

GROUP OF SCALPELLUM PORTORICANUM.

This group is characterized by the shape of the carinal latus, which is as high as wide, with the umbo at or below the middle of the carinal margin, and by the uniformly small size of the species. It comprises *S. tritonis* Hoek, *portoricanum* Pilsbry, *longicarinatum* Pilsbry, and *atlanticum* Gruvel, of the Atlantic, and *S. truncatum* Hoek, *gruvelianum* Pilsbry, and *sanctipetrense* Pilsbry, of the Pacific.

SCALPELLUM TRITONIS Hoek.

1883. *S. tritonis* HOEK, Challenger Rep., Cirripedia, p. 122, pl. v, figs. 9, 10.

Topotype.—Cat. No. 32866, U.S.N.M. *Triton* Station 10, Faröe Channel, north latitude 59° 40′, west longitude 7° 21′, 516 fathoms, in the "warm area" west of the ridge, bottom temperature 46°. August 24, 1882. Jeffreys collection.

A specimen in the Jeffreys collection was taken in the same haul which furnished the two individuals upon which Hoek based the

species. It sat upon a similar ribbed sea-urchin spine. It has the capitulum 7.5 mm. long, 4.5 wide; carina 6 mm. long, 1.6 wide at base. It agrees with Hoek's description and figures except that the rostral latus is somewhat lower and the roof of the carina increases in width more rapidly, being broader at the base than the type figure shows. These differences among examples from one station are indicative of a rather wide range of individual variation.

The species is related to *S. portoricanum*, and more distantly to the group of large forms of the *S. velutinum* type, from which it differs chiefly by the shape of the carinal latus.

SCALPELLUM PORTORICANUM, new species.

1901. *Scalpellum (species)?* Bigelow, Bull. U. S. Fish Commission for 1900, II, p. 179.

Type.—Cat. No. 26353 U.S.N.M.

Type-locality.—Mayaguez Harbor, Porto Rico, between 25 and 76 fathoms, U. S. Fish Commission steamer *Fish Hawk*, 1898–99.

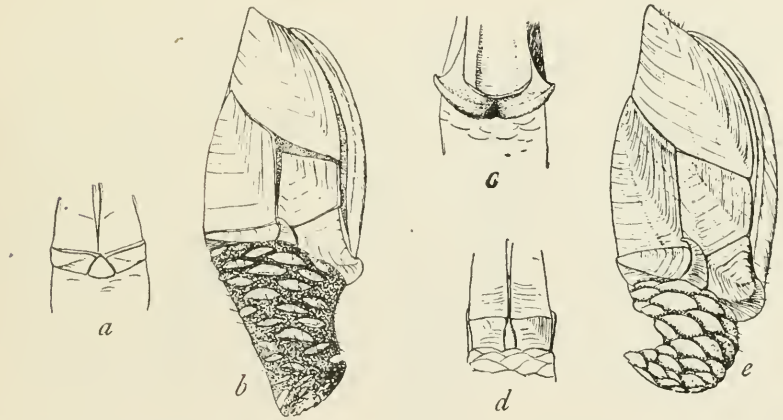


Fig. 8.—Scalpellum portoricanum *a*, *e*, rostral and carinal details; *b*, lateral view × 2½; *d*, *e*, S. portoricanum intonsum. *d*,, detail of rostrum; *c*, lateral view × 4.

The capitulum is rhombic-oblong, composed of 14 wholly calcified plates, covered with a very thin and sparsely pilose cuticle. The plates are weakly marked with lines of growth. The occludent margin of the capitulum is nearly straight.

The scutum is trapezoidal, more than twice as long as wide, occludent and lateral margins parallel and straight, basal margin straight, nearly at right angles to the occludent margin. Umbo apical, not projecting beyond the occludent outline.

The tergum is longer than the scutum and greater in area. Occludent margin straight; basal and carinal margins convex. The apex is erect.

The carina is not much curved, its umbo apical, against but hardly between the terga. The roof is flat, bounded by low lateral ribs, and

faintly marked with arcuate growth-lines. The sides are narrow and concave. Basal margin a little convex.

The upper lateral plate is pentagonal, the tergal and scutal margins longer, subequal, the carinal side shorter and about equal to that against the carinal lateral plate. The side opposed to the inframedian lateral plate is shortest. The umbo is superior, acute, and terminal.

The rostrum is small and triangular, the basal margin slightly greater than the height.

The rostral latus is very narrow, the scutal and basal margins parallel.

The inframedian latus is triangular, the apex curving ventrad, around the end of the rostral lateral plate and between the lower angles of the upper lateral plate and the scutum.

The carinal latus is irregularly triangular. It projects backward beyond the carina. The umbo is recurved and flares outwards, in the shape of a short subspiral horn.

The peduncle is short, with about 13 rows of transversely lengthened scales, about 6 in a row.

Length of the capitulum 12, width 7.7 mm.; length of peduncle 7 mm. Length of the carina 11.3, diameter at base 2.2 mm.

A single example was taken, either at Station 6062 or Station 6063. It was supposed by Mr. Bigelow to be young, but comparison with numerous young examples of the related species of equal size with *S. portoricanum* shows that the Porto Rican form is distinct. It has some resemblance to *S. celatinum* Hoek, but compared with young individuals of equal size, *S. portoricanum* differs markedly by the much narrower roof of the carina, which is in width only one-fifth the length. The rostrum is much larger and the inframedian and carinal latera are of a different shape. *S. pedunculatum* Hoek, from near New Zealand, is also somewhat similar, but the plates of the lower whorl differ.

S. portoricanum is allied to *S. tritonis* Hoek, but differs in the following respects: The occludent margin is straight, not convex; the carinal latera are distinctly wider than high, with outwardly flaring umbones; the sides of the carina are narrower above; finally, the scutum and upper latus differ somewhat in shape.

S. hirsutum Hoek, *hispidum* Sars, *rubrum* Hoek, and *atlanticum* Gruvel have more or less resemblance to *S. portoricanum*, but all differ in various characters of the valves. (Fig. 8 *a–c*.)

SCALPELLUM PORTORICANUM INTONSUM, new subspecies.

Cotypes.—Cat. No. 9757, U.S.N.M.

Type-locality.—*Albatross* Station No. 2401, north latitude 28° 38′ 30″, west longitude 85° 52′ 30″, in 142 fathoms.

There is a series of three individuals taken by the *Albatross* in the Gulf of Mexico west of Florida. They are smaller than the Porto

Rican type, rather densely hairy, and differ from typical *S. portoricanum* somewhat in shape. The capitula measure 9.5, 9.7, and 7 mm. long. The occludent margin of the scutum is distinctly convex, that of the tergum straight or even a trifle concave. The summit is erect, not recurved. The inframedian latus is longer and narrower than in *S. portoricanum*. The rostrum is narrower. The umbones of the carinal latera project less and are situated higher. The valves are sculptured with concentric grooves at subequal intervals. The two larger examples are evidently adult. (Fig. 8 *d*, *e*.)

In the figure the hairs of the cuticle are omitted.

SCALPELLUM LONGICARINATUM, new species.

Type.—Cat. No. 11534, U.S.N.M.

Type-locality.—*Albatross* Station 2668, off northern Florida, north latitude 30° 58′ 30″, west longitude 79° 38′ 30″, 294 fathoms.

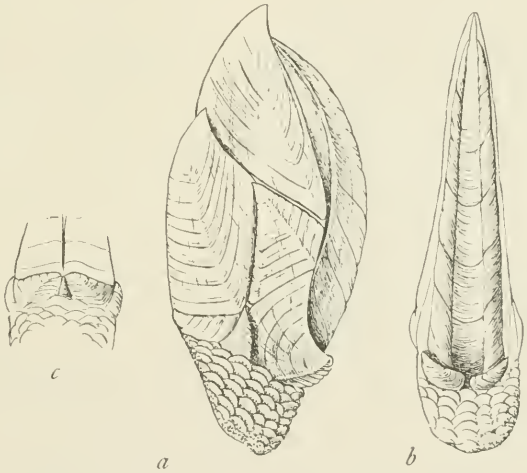


FIG. 9.—SCALPELLUM LONGICARINATUM *a*, LATERAL VIEW; *b*, CARINAL VIEW; *c*, ROSTRAL VIEW × 5.

Other localities.—Cat. No. 14557, U.S.N.M. *Albatross* Station 2415, north latitude 30° 44′, west longitude 79° 26′, 440 fathoms. Cat. No. 14560, U.S.N.M. *Albatross* Station 2663, north latitude 29° 39′, west longitude 79° 49′, in 421 fathoms. Bottom temperature 42.7° F.

The capitulum is long-oval, widest in the middle, both margins convex, but the ventral border is less curved than the dorsal. Composed of 14 fully calcified valves. Cuticle thin, sparsely hairy. Sutures linear. The plates are closely and rather strongly sculptured with unequal lines of growth, with strong grooves at intervals.

The scutum is trapezoidal, the length more than twice the breadth. The occludent margin is convex, the apex acuminate and recurved within the ventral outline, overlying the base of the tergum. The

lateral margin is straight and nearly parallel to the occludent. The straight basal margin meets the others in right angles.

The tergum is triangular, somewhat longer than the scuta. The occludent and basal margins are slightly convex; the carinal margin is slightly concave near the summit, a little convex elsewhere.

The carina is evenly curved with apical umbo. The roof is flat between strong bordering ribs. The sides are wide and divided by a curved sulcus. There are rather deep, spaced growth lines. The basal margin is convex.

The upper latus is quadrangular, the scutal and carinal margins parallel, the carinal about half as long as the scutal. The tergal and basal margins are straight, longer than the carinal. The umbo is apical.

The rostrum is quite small and triangular. The rostral latus is trapezoidal, with parallel upper and basal margins, the basal much the shorter. The height of the plate is scarcely half its length.

The inframedian latus is narrowly triangular, the base about half the height. Umbo apical. There is an inconspicuous triangular wing at the carinal side of the apex.

The carinal latus is very irregularly pentagonal, as wide as high. The carinal margin is concave. The umbones project a little beyond the carina and are somewhat recurved; the margin below them is convex. The portions of the carinal latera, seen in a dorsal view, are obliquely triangular, the roof of the carina extending triangularly between them to the peduncle.

The peduncle is very short, closely covered with transversely lengthened scales, in about 18 rows of about 7 or 8 scales each.

Length of the capitulum 10, breadth 5.4 mm. Length of the peduncle 2 mm. Length of the carina 9.5, diameter at base 2 mm.

This is a strong, robust little species, with unusually emphatic concentric sculpture of striæ and spaced grooves on the plates. It is most nearly related to *S. atlanticum* Gruvel,[a] but in *S. longicarinatum* the carina is less curved above, its sides are wider near the base, and the ribs bordering the roof are very strong. The rostrum and inframedian latus are also unlike in the two forms. *S. longicarinatum* differs from *S. portoricanum* by the erect shape of the inframedian latus, the wider sides and heavy bordering ribs of the carina, and by the general shape of the capitulum, which tapers toward the base, and is more lengthened. It is probably related also to the still unfigured *S. mammillatum* Aurivillius, from off the Azores, but the rostral latera are of a different shape. *S. tenue* Hoek is also related, yet several of the plates differ in shape, and *S. longicarinatum* has a distinct rostrum. The Californian *S. gruvelianum* Pilsbry is allied, but has a shorter carina. In *S. longicarinatum* the carina is nearly as

[a] Expedition du Travailleur et du Talisman, Cirrhipèdes, pl. II, figs. 17, 18.

long as the whole capitulum and extends almost to the apices of the terga.

The largest specimen of the type lot has a capitulum fully 11 mm. long.

Examples from Station 2415 have a more hairy cuticle than the type lot, largely concealing the plates. They are attached to a branching *Oculina*-like coral. (Fig. 9.)

SCALPELLUM SANCTIPETRENSE, new species.

Type.—Cat. No. 32898, U.S.N.M.

Type-locality.—San Pedro, California, in 50 to 75 fathoms. Mrs. Oldroyd.

The capitulum is narrow and long, the length more than twice the width; occludent margin nearly straight, the carinal regularly arched; composed of 14 fully calcified plates, covered with a thin, very short hairy cuticle. The plates are weakly marked with growth lines, and some weak, very faint, radial striæ.

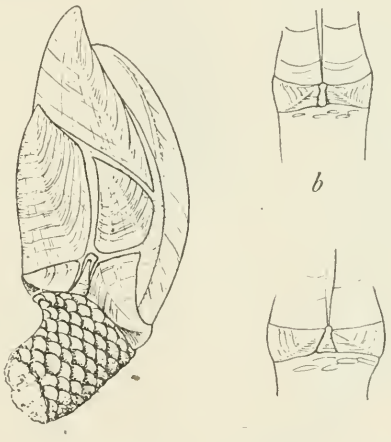


FIG. 10.—SCALPELLUM SANCTIPETRENSE. *a*, LATERAL VIEW × 5; *b*, *c*, ROSTRAL VIEWS OF TWO COTYPES.

The scutum is much more than twice as long as wide, with moderately convex occludent margin. The lateral margin is straight, parallel to the occludent. The umbo is at the acute apex.

The tergum is larger than the scutum, triangular, its occludent margin arched, scutal margin straight, the carinal margin nearly straight, being very weakly concave above and convex below. The plate projects above the summit of the carina only about one-fifth of its carinal length.

The carina is very long, weakly, evenly arched, with apical umbo. The roof is deeply channeled between strong, rounded bordering ribs. The sides are rather wide throughout. There is a small arcuate riblet dividing off a small intraparietal area near the beak. The base of the carina projects triangularly between the carinal latera.

The upper latus is long, with five unequal sides. The scutal margin is longest, and slightly concave. The straight tegal and carinal margins are about equal. The basal margin against the carinal latus is straight, shorter, but about twice the length of the margin against the inframedian latus. The umbo is subterminal.

The rostrum is small and triangular or oblong as high as the rostral latera.

The rostral latus is trapezoidal, its length about double the height. The rostral margin is much shorter than the lateral and the scutal margin is longer than the basal.

The inframedian latus is oblong, its height decidedly over twice the width, trapezoidal, with the umbo raised, close to the rostral border of the plate, at its upper third. The upper end of the plate presents a very short face to the angle of the scutum and a longer one against the upper latus.

The carinal latus is triangular in general shape, though with five sides. The basal and carinal margins are longest; the upper and lateral margins shorter and subequal. The short margin below the carina is arched, and projects slightly beyond the carinal outline. The umbones are below the lower fourth of the dorsal border of the plate.

The peduncle is short, oblique to the capitulum, and covered with imbricating scales in about 13 rows.

Length of the capitulum 8, breadth 3.7 mm. Length of the peduncle 2.6 mm. Length of the carina 7.2, diameter at base 1.1 mm.

This little species is related to *S. gruvelianum*, but it is distinct by the longer, narrower capitulum with consequent differences in the shapes of the individual plates. The umbo of the inframedian latus is not apical, the carina is less curved, and the rostrum is well developed. *S. sanctipetrense* has also much resemblance to the Atlantic *S. longicarinatum*.

Four specimens, of about equal size, were taken.

In some the rostrum is distinctly triangular, in others more of an oblong shape. (Fig. 10.)

SCALPELLUM GRUVELIANUM Pilsbry.

1907. *S. gruvelianum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 197, pl. VII, figs. 1–3, Southwest rock, Santa Barbara Island, 238 fathoms.

In addition to the type-locality, this species was taken at *Albatross* stations 2980, 603 fathoms, and 2947, 269 fathoms, both off southern California. There is a minute rostrum in some examples, but in others it cannot be distinguished.

GROUP OF SCALPELLUM RATHBUNÆ.

Forms similar to the group of *S. portoricanum* except that the inframedian latus has a peculiar and characteristic shape.

SCALPELLUM RATHBUNÆ, new species.

Type.—Cat. No. 32912 U.S.N.M.

Type-locality.—*Albatross* Station 2768, off the east coast of Patagonia, south latitude 42° 24′, west longitude 38° 30′, in 43 fathoms.

The capitulum is of the usual quadrate form, the plates separated by narrow but distinct chitinous sutures, covered with a very thin, smooth cuticle. The occludent border is straight, except near the apex.

The scutum is quadrangular, with straight occludent margin. The length is about twice the width. Umbo at the acute apex. The surface is divided into an anterior radially costate and a tergo-lateral smooth area.

The tergum is a little longer than the scutum. The occludent margin is convex above, the apex being recurved. The scuto-lateral margin is slightly convex, the carinal margin nearly straight.

The carina is regularly and rather strongly curved, with the umbo terminal. The roof is deeply groved between strong sulcate bordering ribs. The sides are rather narrow and of nearly equal width throughout.

The upper lateral plate is quadrangular, the scutal margin longest, slightly concave, parallel to the carinal margin. Tergal margin straight. Basal margin oblique. The scutal half of the plate is sculptured with a few radiating riblets. Umbo at the apex.

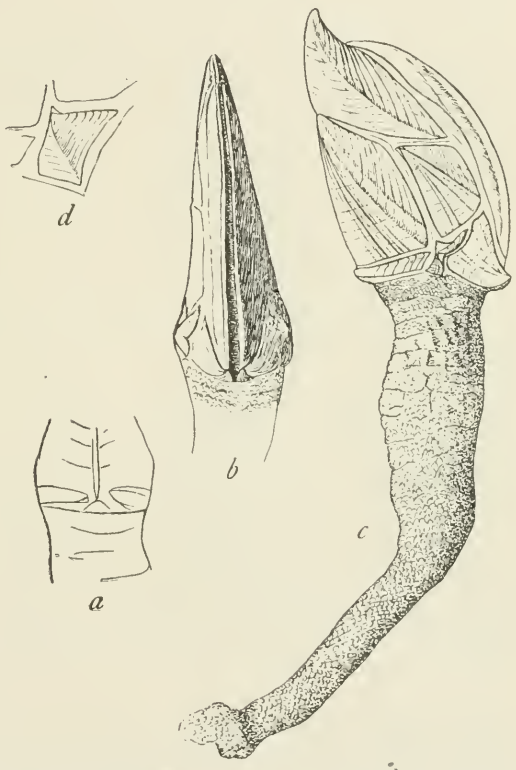


FIG. 11.—SCALPELLUM RATHBUNÆ. *a*, ROSTRAL, *b*, CARINAL, AND *c*, LATERAL VIEWS OF TYPE × 2; *d*, INFRAMEDIAN LATUS OF ANOTHER INDIVIDUAL × 4.

The rostrum is triangular, very small and short, somewhat wider than high.

The rostral latus is low, the length of the plate being more than four times its width. The upper and lower margins are parallel. An angle runs obliquely from the beak toward the baso-lateral angle.

The inframedian latus is quadrangular, with one of the upper angles produced toward the carina. The umbo is subcentral, a little nearer the rostral margin; from it a rib runs to each of the angles of the plate.

The carinal latus is triangular, with the umbo projecting beyond the base of the carina and a little recurved. Several ribs radiate from the umbo.

The peduncle is about as long as the capitulum, closely covered with an open mosaic or pavement of very minute, scarcely imbricating scales, of about 0.2 or 0.3 mm. width.

Length of capitulum 20, width 12 mm. Length of peduncle 21 mm. Length of the carina 19, diameter at base 2 mm.

In this species the inframedian lateral plate is of a peculiar irregular shape. The rostral latera are narrow, unlike those of related species.

A second example from the same station as the type differs by having the bordering ribs almost obliterated on the lower half of the carina, and the inframedian lateral plate on the left side is almost regularly quadrate (fig. 11*d*).

This species is named for Miss Mary J. Rathbun, the accomplished carcinologist of the United States National Museum. (Fig. 11.)

SCALPELLUM SOROR, new species.

Type.—Cat. No. 32913, U.S.N.M.

Type-locality.—*Albatross* Station 2818, Galapagos Islands, south latitude 36′ 30″, west longitude 89° 19′, 634 fathoms, bottom temperature 39.9°.

The capitulum is nearly twice as long as wide, the plates nearly in contact, joined by narrow chitinous sutures, covered by a very thin smooth cuticle. The ventral (occludent) border is straight.

The scutum is narrow, the width contained 2½ times in the length; occludent and lateral margins are straight and parallel, the basal margin nearly at right angles with them. There is a very weak rib along the occludent margin, and another from apex to the baso-lateral angle; elsewhere the surface is marked with weak, widely spaced growth-wrinkles only.

The tergum is a trifle longer than the scutum, nearly three times as long as wide. The occludent margin is straight, the baso-lateral slightly convex, the carinal margin is slightly concave near the apex, elsewhere slightly convex. It has weak sculpture of widely spaced V-shaped growth-lines.

The carina is well curved, with apical umbo. Roof deeply channeled between two stout marginal ribs. Sides narrow. Basal margin rounded.

The upper lateral plate is quadrangular, the scutal and carinal borders straight and parallel, the scutal more than double the length of the carinal. The tergal margin is straight. Umbo acute and terminal. The surface is marked with growth-lines only.

There is a minute oval rostrum, deeply embedded in the cuticle and readily overlooked.

The rostral latera are small, wedge-shaped, their acute apices meeting on the ventral line.

The inframedian latus is of very irregular shape, narrowly oblong, with one upper angle produced toward the carina. The umbo is at the upper third of the plate on the rostral side, the wedge-shaped surface below it being raised above the rest of the plate.

The carinal latus is imperfectly triangular, with a convex margin projecting below the carina, the umbo being a little recurved, situated at the bases of the ribs of the carina and at about a third the height of the plate. The basal margin is about equal to the lateral margin. The latter is sinuous, concave in the middle, for the reception of the upper lobe of the inframedian plate.

The peduncle is shorter than the capitulum, closely covered with imbricating scales about 1 mm. wide.

Length of the capitulum 17, breadth 8.7 mm. Length of the peduncle 9 mm. Length of the carina 16, diameter at base 3.3 mm.

This species closely resembles *S. rathbunæ*, from which it differs chiefly by the absence of radial riblets on the scuta and upper latera, the wider roof of the carina, its bordering ribs not sulcate, and by the very much larger scales of the peduncle. *S. soror* is like *S. rathbunæ* in the very peculiar shape of the inframedian latera. (Fig. 12.)

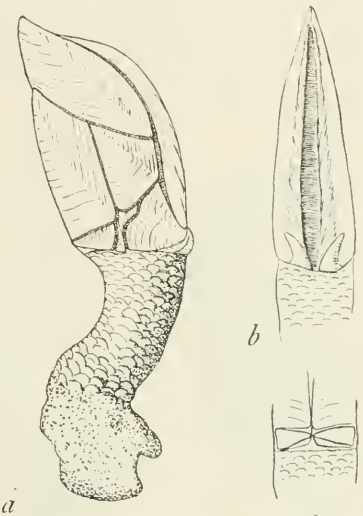


FIG. 12.—SCALPELLUM SOROR. *a*, LATERAL VIEW; *b*, CARINAL VIEW; *c*, ROSTRAL VIEW, × 2.

GROUP OF SCALPELLUM ARIETINUM.

The carinal latera project far downward and flare outward below the carina, with the umbones at their free ends. This modification is unlike any other hitherto known species.

SCALPELLUM ARIETINUM, new species.

Type.—Cat. No. 9792, U.S.N.M.

Type-locality.—*Albatross* Station 2405, Gulf of Mexico, north latitude 28° 45′, west longitude 85° 02′, in 30 fathoms.

Other localities.—Cat. No. 10055. *Albatross* Station 2315, Straits of Florida, north latitude 24° 26′, west longitude 81° 48′ 15″ in 37 fathoms, on spines of *Cidaris tribuloides*.

The capitulum is subtrapezoidal, the occludent border straight; of a crimson color (or more or less tinted with crimson on a yellowish

ground); composed of 14 fully calcified plates separated by linear sutures. The plates are sculptured with growth-lines and some fine, indistinct radial striæ. The cuticle is thin and inconspicuous, nearly smooth except on the keel, where the roof is finely and shortly pilose, and crossed by six to eight transverse tufts of longer hairs.

The scutum is about twice as long as wide, its occludent margin very slightly convex. The lateral margin is concave near the tergolateral angle, elsewhere convex. Basal margin straight. The umbo is nearly terminal, bent inward, with a very small triangular area outside and extending slightly above it, at least in old individuals.

The tergum is much longer than the scutum, triangular. Its occludent margin is nearly straight, but recedes slightly near the erect apex. Scutal margin is straight. The carinal margin has a slight prominence just above the summit of the carina.

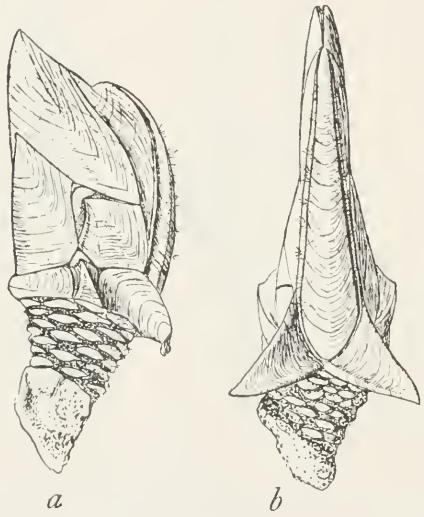


Fig. 13.—Scalpellum arietinum. *a*, lateral view, 3; *b*, dorsal view · 4.

The carina is moderately arched, and *extends a short distance above the prominent umbo.* Its upper end is rounded, and not in the least interposed between the scuta. The roof is nearly flat, bounded by distinct but obtuse angles. A low rib runs on each side parallel to and near the angles. The lines of growth on the roof are deeply arched downward. The sides are flat and very wide in the upper half, delicately sculptured with fine longitudinal and radial striæ. The basal margin is deeply rounded. There is no chitinous space between the carina and the other plates.

The upper latus is pentagonal, the scutal and carinal margins about equal and parallel, the tergal margin a trifle longer. The basal margin is shorter, and the oblique margin against the inframedian plate is still shorter. The umbo is not quite apical, the apex beyond it being obtuse, rounded, and white.

The rostrum is quite small and triangular, with equal sides.

The rostral latus is low, about five times as long as high, and somewhat narrower in front than at the lateral end. It stands out in relief above the surface of the scutum.

The inframedian latus is irregularly pentagonal, about twice as high as wide. It has a short, straight margin against the lateral edge of the scutum, a longer straight one against the upper latus, about as long

as the somewhat concave margins against the carinal and rostral latera. The umbo is elevated and at the upper fourth of the plate. From it obtuse ridges radiate to the two basal angles of the plate.

The carinal latus is somewhat triangular. Its apical half projects free behind and below the carina, flaring strongly outward and noticeably twisted. Apex acute. In dorsal view the carina is seen to extend between the horn-like latera nearly to the peduncle. The spread from apex to apex of the two carinal latera is 6 mm. in the type specimen.

The peduncle is short, covered with rather large scales in about 13 rows of about 8 scales each.

Length of the capitulum 11.6, breadth 7 mm. Length of the peduncle 6 mm. Length of carina 12 mm., diameter near base 1.7 mm.

The laterally-flaring, horn-like carinal latera, the wide sides of the carina, and the position of its umbo, as well as the more or less ruddy color, all distinguish this fine species. (Fig. 13.)

SCALPELLUM DICERATUM new species.

Type.—Cat. No. 11181 U.S.N.M.

Type-locality.—*Albatross* Station 2319–2350, off Habana, Cuba, on crinoid arms.

Other localities.—Cat. No. 32867. *Albatross* Station 2405, Gulf of Mexico, west of Florida, 30 fathoms. No. 32868. *Albatross* Station 2324, off Habana, 33 fathoms, on a *Cidaris* spine. No. 32869. *Albatross* Station 2315, Straits of Florida, 37 fathoms. No. 9474. *Albatross* Station 2317, Straits of Florida, north latitude 24° 25′ 45″, west longitude 81° 46′, in 45 fathoms, temperature 75° F., on the spines of *Cidaris*.

The capitulum is similar in shape and general appearance to that of *S. arietinum*. The ventral margin is nearly straight, but with a low prominence in the middle. It is more or less deeply crimson tinted, but varies to creamy white in some individuals.

The scutum has a terminal mucro, and is shaped like that of *S. arietinum*. The tergum is also like that of *S. arietinum*.

The carina is well arched, with an *acute, apical umbo, which intrudes between the terga*. The roof is convex, with about 8 arcuate, transverse hair tufts, as in *S. arietinum*. The sides are bicostate and *very narrow*, not widened above. Basal margin rounded.

The upper latus is pentagonal, the scutal margin longest, the tergal, carinal and basal successively shorter, the margin against the inframedian plate shortest, less than half the basal margin. The umbo is acute and terminal.

The rostrum is very small and triangular. The rostral latus is shaped like that of *S. arietinum*. It has two low ridges running from the apex to the upper and lower angles of the lateral end of the plate.

The inframedian latus is narrow, *triangular, with the apex strongly curved toward the occludent border*, overlying the baso-lateral angle of the scutum. A low rounded rib runs down each side. The umbo is apical.

The carinal latus is triangular, its apical half projecting free behind and downward below the carina, and also flaring outward, though less than in *S. arietinum*. The spread from tip to tip is 3.75 mm. in the type specimen.

The peduncle is clothed with rather large, narrow, transversely lengthened scales, in about 8 rows of 8 or 9 scales each.

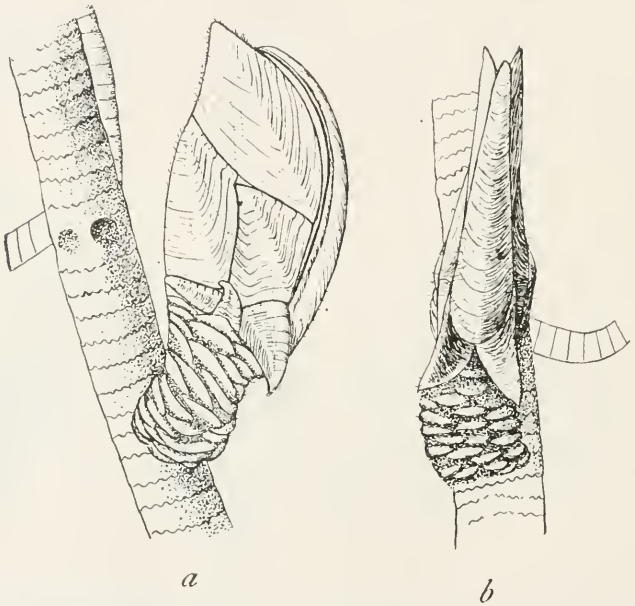


FIG. 14.—SCALPELLUM DICERATUM. *a*, LATERAL VIEW; AND *b*, CARINAL VIEW × 3.

Length of the capitulum 13.5, width 7.8 mm. Length of the peduncle 7 mm. Length of the carina 13.5, diameter near the base 2.8 mm.

This species lives with *S. arietinum* on the spines of echinoids and the arms of crinoids, in shallow or moderate depths. The two species are obviously related, yet quite distinct by the difference in shape of the carina and inframedian latus, and the terminal umbones of the inframedian and upper latera and of the carina in *S. diceratum*, while in *S. arietinum* the umbones of these plates are removed from the apices. There are also some minor differences in other plates, readily seen in the figures. The carinal latera sometimes diverge almost as widely as in *S. arietinum*, and much more than in the figured type. The color varies from crimson to pure white. (Fig. 14.)

Section V.

Rostral latus high with short basal border, usually larger than the narrow inframedian latus; rostrum narrow or wanting; umbo of the carina apical or subapical; carinal latus higher than wide, the umbo not projecting; plates 13 or 14.

A numerous group of small, deep-water species, evidently related to *Holoscalpellum*. The complemental males so far as known are like those of *Holoscalpellum*.

KEY TO SPECIES.

a. Inframedian latus wineglass- or hourglass-shaped, being dilated toward the two ends, more or less contracted at or below the middle; the umbo at or below the middle.

b. Upper portion of inframedian latus much more expanded than the lower.

c. Lower margin of the upper latus straight; no rostrum.

d. Plates sculptured with widely-spaced low riblets parallel to lines of growth. growth. California ..... *S. proximum.*

dd. Plates with sculpture of unequal growth-wrinkles, and fine, low radial striæ. Antilles, etc ..... *S. idioplax.*

cc. Lower margin of the upper latus concave or sinuate; plates marked with weak, spaced growth-wrinkles only; umbo of inframedian latus median; a minute, rounded rostrum between the apices of the rostral latera. Atlantic ..... *S. sinuatum.*

bb. Upper portion of the rather narrow inframedian latus not much wider than the basal portion.

c. Roof of the carina strongly convex, the umbo apical. Atlantic. *S. gracilius.*

cc. Roof of carina flat or nearly so.

d. Umbo of carina removed a short distance from the apex; Atlantic. *S. carinatum.*

dd. Umbo of carina apical.

e. Carina angular at the sides of the slightly convex roof, the sides narrow; umbo of upper latus not entering a bay in the scutum. Southern California ..... *S. perlongum.*

ee. Carina with slight ribs at the sides of the flat roof, the sides wide in the upper part; umbo of upper latus entering a bay in the scutum. Atlantic. *S. albatrossianum.*

aa. Inframedian latus narrowly triangular, tapering upward to the acute apical umbo.

b. Carina unusually short, with strongly convex roof.

c. Carina not extending up beyond middle of the carinal margin of tergum; rostrum vestigeal or wanting; carinal latus rather small, triangular; inframedian latus reduced ..... *S. pentacrinarum.*

cc. Carina extending above middle of terga; rostrum narrow but well developed; carinal latus pentagonal, very large; inframedian latus well developed. *S. micrum.*

bb. Carina long, its roof flattened, often with bordering ribs.

c. Plates of the upper whorl with strong radial sculpture. Atlantic. *S. formosum.*

cc. Plates of the upper whorl without conspicuous radial sculpture; inframedian latus very narrow.

d. Rostrum well developed; occludent margin convex; off Chile ..... *S. gracile.*

dd. Rostrum wanting or represented by a linear rudiment.

e. Umbo of carinal latus at baso-carinal angle ..... *S. antillarum.*

ee. Umbo of carinal latus at the middle to lower fourth of its carinal margin; carinal aspect of carinal latera radially ribbed.

f. Carina with ribs bounding the flat roof; umbo of carinal latus at the lower third or fourth.

g. Entire carinal latus sculptured with radiating riblets; growth-lines on roof of carina V-shaped; umbo of upper latus terminal at scuto-tergal angle ..... *S. semisculptum.*

gg. Only the basal area of carinal latus radially sculptured; growth-lines on the roof straight; umbo of upper latus not terminal. *S. aurivillii.*

ff. Carina angular at the sides of the flat roof; umbo of carinal latus near middle of its carinal margin; carinal latera meeting in a rather long zigzag suture below the carina; rostrum linear; occludent margin straight ..... *S. galapaganum.*

GROUP OF SCALPELLUM IDIOPLAX.

Inframedian latus hourglass- or wineglass-shaped, the umbo median or below, at the contracted part of the plate.

SCALPELLUM PROXIMUM Pilsbry.

1907. *Scalpellum proximum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 197, pl. VI, figs. 9–11.

Type.—Cat. No. 32422 U.S.N.M.

Type-locality.—Vicinity of San Diego, California, in 1,000 fathoms.

SCALPELLUM IDIOPLAX, new species.

Type.—Cat. No. 7843, U.S.N.M.

Type-locality.—*Albatross* Station 2140, Caribbean Sea, north latitude 17° 36′ 10″, west longitude 76° 46′ 05″, in 966 fathoms, sand.

Other localities.—Cat. Nos. 11530 and 14558, *Albatross* Station 2656, between Bahamas and Cape Fear, North Carolina, in 572 fathoms.

The capitulum is twice as long as wide, widest in the middle, tapering toward summit and base. The ventral and dorsal margins are about equally convex. It is composed of 13 fully calcified plates. The cuticle is very thin and smooth. The plates are sculptured with unequal lines of growth and fine, low, radial striæ.

The scutum is more than twice as long as wide. The occludent margin is convex; basal and upper margins nearly straight, oblique. The lateral margin is irregular. It projects in an angular lobe at the upper lateral angle, and is deeply excavated below the lobe for the reception of the apex of the upper lateral plate. The apex is acuminate.

The tergum is decidedly longer than the scutum, triangular, the occludent margin slightly convex, the basal a trifle concave, and the

carinal margin is very weakly sigmoid, being concave in its upper portion, convex in the lower.

The carina is long, more arcuate near the terminal mucro. The roof is flat, with bordering ribs. The fine growth-striæ across the roof are convex upwardly. The sides are rather wide, regularly tapering toward the base. The basal margin is slightly concave.

The upper lateral plate is hexagonal-piriform. The scutal and tergal margins are long and a little concave. The carinal margin and that against the carinal latus are short and equal. The basal margin, against the summit of the inframedian latus, and the apical border, against the latero-tergal lobe of the scutum, are very short. The apex is subterminal.

There is no rostrum.

The rostral latus is square, about as high as wide. The margins are straight. The lower lateral corner is rounded. The ventral margins of the rostral latera are in contact.

The inframedian lateral plate is wineglass shaped, composed of a very small basal and large upper segment, very narrow at their junction, where the umbo is situated. The upper margin has a longer scutal margin and a shorter margin in contact with the upper lateral plate.

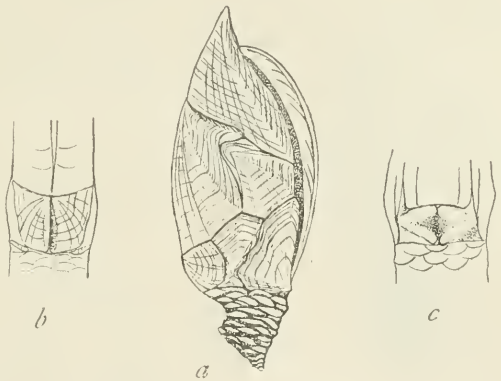


FIG. 15.—SCALPELLUM IDIOPLAX. *a*, LATERAL VIEW × 2; *b*, ROSTRAL VIEW; *c*, DORSAL VIEW.

The carinal latus is twice as high as wide, of very irregular shape. The umbo projects slightly beyond the carina, near the base of the plate. The carinal latera meet below the keel.

The peduncle is very short, with 10 rows of transversely lengthened scales, about 8 scales in a row.

Length of the capitulum 18, breadth 9 mm. Length of the peduncle 4.3 mm. Length of the carina 15, diameter at base 3 mm.

This species is well characterized by the wineglass-shaped inframedian lateral plate and the peculiar contour of the inner margin of the scutum.

It is closely related to *S. distinctum* Hoek, a Pacific species; but that has the scuta, upper latera, and rostral latera different in shape. *S. carinatum* Hoek, from off Tristan da Cunha, resembles *S. idioplax* in the shape of the scutum, upper latus, and inframedian latus, but it

differs by having the umbo of the carina removed from the summit, by the shape of the tergum and the presence of a minute rostrum.

Besides several examples from the type locality, in the Caribbean Sea, two specimens were taken at a station north of the Bahamas. These differ from the types by their smaller size—the larger having a capitulum 11 mm. long—and by the weaker radial striæ, which are very minute. (Fig. 15.)

SCALPELLUM SINUATUM, new species.

Type.—Cat. No. 9013, U.S.N.M.

Type-locality.—*Albatross* Station 2037, east of Maryland, north latitude 38° 53′, west longitude 69° 23′ 30″, in 1,731 fathoms, bottom temperature 38° F.

The capitulum is trapezoidal, about twice as long as wide, with slightly curved occludent border, and of a pale yellowish-white tint; not hairy; valves 14, nearly smooth.

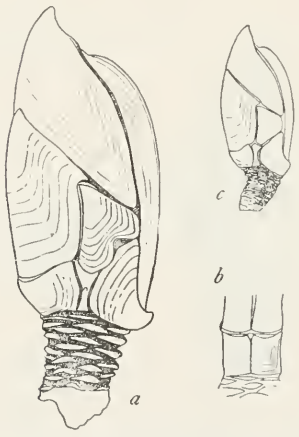


FIG. 16.—SCALPELLUM SINUATUM. *a, b,* LATERAL VIEW AND ROSTRAL DETAIL OF TYPE, AND *c,* A YOUNG TOPOTYPE, ALL × 3.

The scutum has a convex occludent margin. The lateral margin is produced in a point at the tergal end, excavated below it. The basal margin is somewhat convex.

The scutum is of the usual triangular shape, with convex occludent margin and narrow, slightly recurved apex. There is a slight prominence on the carinal margin above the carina.

The carina is long, arcuate, with apical umbo. The roof is flat between two moderate rounded ribs. The sides are rather wide above, tapering to the base.

The upper lateral plate is subtriangular, with a deep notch in the lower margin. The scutal margin is decidedly longer than the tergal. Mucro at the scuto-tergal angle.

The rostrum is very small, subtriangular, lying between the umbones of the rostral latera.

The rostral lateral plate is quadrangular, nearly as high as wide, but with the basal margin shorter than the scutal. The lateral margin is convex.

The inframedian lateral is wineglass shaped, narrowest at the lower third. The upper portion is triangular, its upper face concave, against the upper latus, but one angle extends up, touching the scutum. The umbo is median. The base of the plate is expanded, forming a smaller triangle than the upper part.

The carinal latus is irregularly triangular, projecting a little beyond and below the carina. The two latera meet in a very short suture below the carina. Umbo slightly recurved at the base of the carina.

The peduncle is very short, with 10 rows of large scales, about 6 scales in a row.

Length of capitulum about 13.5, width 7 mm.; length of peduncle 5 mm.

The type-specimen was broken in the dredge across the terga and upper part of the scuta. The species is notable for the shape of the upper latus, which is unlike any known form of the same group. The very small, nodule-like rostrum, visible only between the apices of the rostral latera, is also highly characteristic.

A young example (fig. 16 *c*) occurred with the type and is here illustrated to show the changes which take place with age. The upper lateral plate is normal in shape, without the basal notch of the adult. This would be anticipated from observing the growth-lines of the latter. The rostrum is relatively better developed but formed as in the adult type. The inframedian lateral plate is somewhat less individualized than in the type. Length of capitulum 7, breadth 3.1 mm.

S. recurvitergum Gruvel, from near the Azores, is a closely allied form, differing by its strongly recurved terga, the somewhat differently shaped upper latus, and the hairy peduncle and carina. (Fig. 16.)

SCALPELLUM GRACILIUS, new species.

Type.— Cat. No. 32863, U.S.N.M.

Type-locality.—*Albatross* Station 2678, off Cape Romain, South Carolina, north latitude 32° 40′, west longitude 76° 40′ 30″, in 731 fathoms; bottom temperature 38.7°.

The capitulum is narrow, its length more than double the width; both ventral and dorsal margins are slightly convex; composed of 14 fully calcified plates; covered with a thin smooth cuticle. Sutures linear. The plates have slight growth lines, and a few barely perceptible radial striæ.

The scutum is fully twice as long as wide; the occludent margin convex, except near the base, where it is slightly concave. Lateral margin slightly sinuous, subparallel to the occludent margin. Basal margin passing into the lateral in a regular curve. The apex is a little incurved and acuminate.

The tergum is much longer and wider than the scutum, triangular. The occludent margin is slightly convex, basal margin straight, and the carinal margin is very weakly sigmoid, nearly straight. The apex is erect.

The carina is regularly curved, with the apex terminal. The roof is strongly and evenly convex, curving into the sides, which are rather

wide. The basal margin is convex. The lines of growth on the roof curve deeply downward.

The upper latus is irregularly pentagonal. The scutal margin is much the longest and straight; the tergal shorter and straight. The carinal margin and that against the carinal latus are still shorter, subequal. The basal margin, against the inframedian lateral plate, is very short. The apex is subterminal.

The rostrum is reduced to a linear rudiment, separating the rostral latera along the upper half of their contiguous borders.

The rostral latus is subtriangular, the three sides about equal. The scutal margin is slightly concave, the ventral margin straight, and the baso-lateral margin is convex.

The inframedian latus is oblong, narrow, contracted slightly below the middle, a little dilated above and below the contraction, the basal segment much smaller than the upper. The umbo is close to the base.

The carinal latus is very long and narrow, nearly as long as the scuta. The carinal margin is straight, the lateral and basal margins convex. The umbo is close to, but not at, the base of the plate, below the carina. It does not project beyond it. The two plates meet in a very short straight suture below the carina.

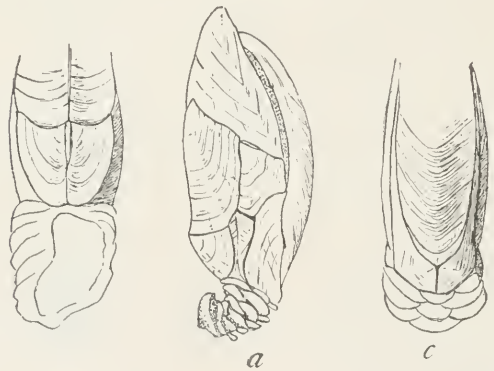


FIG. 17.—SCALPELLUM GRACILIUS. *a*, LATERAL VIEW × 5, WITH DETAILS OF, *b*, ROSTRUM AND, *c*, CARINA.

The peduncle is very short, closely covered with large transversely lengthened scales, in six rows of about 5 scales each.

Length of the capitulum 8, breadth 3.3, mm.; length of the peduncle 1.8 mm.; length of the carina 6.3, diameter at base 1 mm.

The more conspicuous features of this small species are its excessively narrow rostrum, the rounded roof of the carina, the somewhat hour-glass shaped inframedian latera, and the very long and narrow carinal latera. Where the rostrum is so reduced as in this species, its complete elimination in some individuals would occasion little surprise. Only two specimens were taken, the second one being immature, about half the size of the type. They were seated upon a slender annelid tube.

S. gracilius is closely related to *S. novæzelandiæ* Hoek and *S. flavum* Hoek, both antipodal species. *S. novæzelandiæ* differs by having the carina flat-roofed. *S. flavum* is very close to *S. gracilius*, but

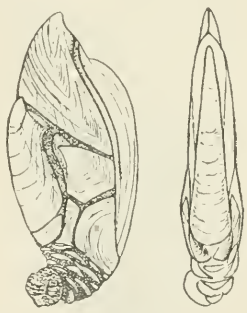
the rostral latus is smaller, the carinal latus decidedly wider, and the roof of the carina less rounded; yet were it not for the wide geographic separation of the two species I would be disposed to rank the North Atlantic species as a race or variety of *S. flarum*. Neither *S. novæzelandiæ* nor *S. flarum* has a rostrum.

S. novæzelandiæ has been reported from the Northeastern Atlantic by M. Gruvel,[a] who so identified three specimens taken by the *Travailleur* in north latitude 38° 8′, west longitude 12° 3′, in 2,400–2,500 meters. They differ in various minor details from Hoek's type. (Fig. 17.)

SCALPELLUM CARINATUM Hoek.

1883. *S. carinatum* Hoek, *Challenger* Report, Cirripedia, p. 76, pl. III, figs. 7, 8. Near Tristan da Cunha, 1,000 fathoms.

Localities.—Cat. No. 32872, U.S.N.M., *Albatross* Station 2731, off Cape Hatteras, north latitude 36° 45′, west longitude 74° 28′, in 781 fathoms, on *Scalpellum velutinum*. Also No. 32876, U. S. N. M., *Albatross* Station 2111, off Cape Hatteras, north latitude 35° 09′ 50″, west longitude 74° 57′ 40″, in 938 fathoms.



a *b*

Fig. 18.—Scalpellum carinatum. *a*, lateral and, *b*, carinal views × 5.

The specimens measure 9 and 11.5 mm. (No. 32872) and 7 mm. (No. 32876) in length of capitulum. The peduncle is very short and oblique. The tergum, in these American examples, is longer and narrower than in Hoek's figured type. The rostrum is represented only by a small nodule between the apices of the rostral latera in No. 32876, but I can see no trace of it in the two specimens from the other station. It is a rather stout little species, with the roof of the carina flat and rapidly widening. The individual from Station 2111 is figured, to show the features of the American form. (Fig. 18.)

SCALPELLUM PERLONGUM Pilsbry.

1907. *Scalpellum perlongum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 198, pl. VI, fig. 12.

Type.—Cat. No. 32420 U.S.N.M.

Type-locality.—Off Point Loma Lighthouse, near San Diego, California, in 639 fathoms.

[a] Exped. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 54, pl. II, figs. xii, xiii, xv.

SCALPELLUM ALBATROSSIANUM, new species.

Type.—Cat. No. 32891, U.S.N.M.

Type-locality.—*Albatross* Station 2226, off Cape Hatteras, north latitude 37°, west longitude 71° 54′, in 2,045 fathoms, on *Scalpellum regium*.

The capitulum is fully twice as long as wide, widest in the middle, tapering toward base and summit. The occludent margin is regularly arched, summit a trifle recurved. Composed of thirteen fully calcified plates, separated by very narrow chitinous sutures. The plates are distinctly marked with lines of growth, and covered with a thin, shortly and rather sparsely pilose cuticle.

The scutum is slightly more than twice as long as wide, its occludent margin regularly arcuate. The lateral margin is about two-thirds as long as the scutal. It is deeply sinuated, for the reception of the apex of the upper latus, just below the tergo-lateral angle, which is extended in a narrow acute lobe. The baso-lateral angle is rounded, and rests for a short distance against the inframedian latus.

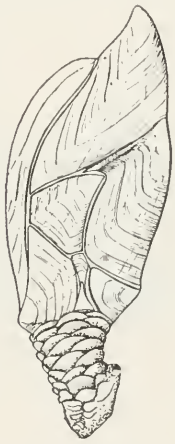


FIG. 19.—SCALPELLUM ALBATROSSIANUM × 4.

The tergum is triangular, longer, and wider than the scutum. Occludent margin arcuate, basal margin straight, carinal margin weakly sigmoid, being concave above, convex below. The apex of the carina reaches its upper third. The apex is a trifle recurved.

The carina is strongly arched above, less so in the lower half. The umbo is apical, against but not between the terga. The roof is flat, bounded by very low, narrow ribs. The sides are wide in the upper half, narrow and tapering in the lower.

The upper latus is triangular in general outline, but with five facets. The scutal margin is longest, slightly concave; the tergal is a little shorter, a trifle convex. The carinal margin is about half as long as the scutal and a little shorter than the carino-lateral. The very short basal margin is in contact with the summit of the inframedian latus. The umbo is terminal, projecting into a recess in the scutum.

There is no rostrum.

The rostral latus is wider than high, with the umbo slightly projecting from the rostral margin. The straight basal margin curves into the lateral margin.

The inframedian latus is oblong, about three times as high as wide, with slightly raised central mucro, from which low ribs radiate to the angles of the plate. The upper end is truncated, and the base is a little dilated laterally.

The carinal latus is about twice as high as wide, with the umbo slightly projecting behind at the lower fifth of the carinal margin. The carinal margin is slightly concave above the umbo, convex below it. The lateral margin is nearly parallel with the carinal.

The very short peduncle is closely covered with rounded imbricating scales, in nine rows of about eight scales each.

Length of the capitulum 10.5, width 5.3 mm. Length of the peduncle 3.5 mm. Length of the carina 9, diameter at base 1.7 mm.

This species, represented by an unique example, stands close to *S. novozelandiæ* Hoek, but differs by the shape of the scutum. In *S. minutum* and *S. abyssicola* the carinal margin of the upper latus is longer. It resembles *S. idioplax* in the shape of the scutum, but the inframedian and upper latera differ. The American form of *S. carinatum* differs from *S. albatrossianum* by having the umbones of the carina and upper latus removed from the apices of these plates; and the typical *S. carinatum* further differs by the shape of the tergum. In ventral view *S. albatrossianum* resembles the Californian *S. perlongum* Pilsbry. (Fig. 19.)

GROUP OF SCALPELLUM AURIVILLII.

Inframedian latus very narrow, widest at the base, tapering to the acute apical umbo.

SCALPELLUM PENTACRINARUM, new species.

Type.—Cat. No. 32870, U.S.N.M.

Type locality.—*Albatross* Stations 2319–2350, off Habana, Cuba, on a pinnule of *Pentacrinus*.

The capitulum is subtriangular, the slightly convex occludent margin about twice the length of either of the other sides of the triangle. It is composed of thirteen plates, which are fully calcified, separated by linear sutures, and without perceptible cuticle. The plates are lilac tinted, nearly white near the occludent margin, marked with fine lines of growth and the scutum, tergum, and upper latus have also fine, low radial striæ.

The scutum is long and narrow, widest at the base, which occupies fully three-fourths the width of the capitulum at that place. The occludent margin is straight except near the summit, where it curves slightly inward. The long, straight lateral margin converges slightly upward toward the occludent, so that the plate is narrower at the tergo-lateral angle than at the base. The straight basal margin makes a right angle with the occludent margin. The acute apex is at the occludent margin. A low, narrow riblet runs from the apex to the baso-lateral angle.

The tergum is a little longer and wider than the scutum, triangular, with erect apex. The occludent margin is slightly convex. The

scutal and lateral margins are straight and subequal, meeting at an obtuse angle. The carinal margin is nearly straight.

The carina is unusually short, irregularly arched, having several straightened faces in its dorsal contour. The roof is rounded, passing directly into the narrow sides, and marked with faint transverse, arcuate growth-lines. The base extends triangularly between the carinal latera. The apex is terminal and incurved, but not intruded between the terga. It reaches only to the lower fourth of the carinal margin of the terga.

The upper latus is wedge-shaped. The scutal margin is straight and about twice the length of the straight tergal margin. The carinal margin is slightly convex. The umbo is terminal at the scutotergal angle, which is a little less than a right angle.

There is no rostrum, but a lanceolate space between the rostral latera is bridged with yellowish chitin.

The rostral latus is quadrangular, at least twice as wide as high. The basal margin is much shorter than the scutal and parallel to it. The rostral margin is concave, the lateral somewhat irregular. A low diagonal riblet divides the plate into triangular areas.

The inframedian latus is very narrow, sinuous, and as high as the adjacent latera, its umbo at the acute apex. It is apparently concrescent or partially so, with the carinal latera, the suture between them being very inconspicuous.

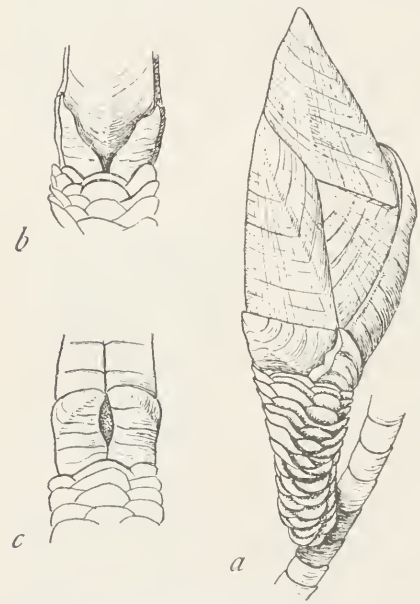


FIG. 29.—SCALPELLUM PENTACRINARUM × 6, WITH *b*, DORSAL AND *c*, VENTRAL DETAILS.

The carinal latus is triangular, higher than wide, the apex curved toward the inframedian latus. The two latera almost meet at the base below the carina.

The peduncle is covered with wide imbricating scales in six very distinct rows of about fifteen scales each. The scales of adjacent rows interlock only shortly.

Length of the capitulum 8, breadth 3.7 mm. Length of the peduncle 3.7 mm. Length of the carina 5.2, diameter near base 1.2 mm.

This peculiar little species resembles *S. balanoides* in the short carina and triangular upper latus, but the carinal latus is short, and

the carina reaches only to about the lower fourth of the carinal margins of the terga. The almost concrescent inframedian and carinal latera are a peculiar feature of the new form. At first sight inframedian latera seem to be wanting. (Fig. 20.)

SCALPELLUM MICRUM, new species.

Type.—Cat. No. 32879, U.S.N.M.

Type-locality.—*Albatross* Station 2668, between the Bahamas and Cape Fear, North Carolina, in 294 fathoms, on a delicate Hydroid, bottom temperature 46.3 F.

The capitulum is oval, widest in the middle, tapering toward both ends; the ventral and dorsal margins are about equally curved; compressed and white; composed of fourteen fully calcified plates, separated by linear sutures. There is no perceptible cuticle. The plates are faintly marked with lines of growth and a few very faint radial striæ.

The scutum is about twice as long as wide, the occludent and lateral margins parallel, the basal margin nearly at right angles to them. The upper third of the occludent margin bends backward. The umbo is acutè, terminal, and recurved.

The tergum is wider and longer than the scutum, triangular. The occludent margin is convex; scuto-lateral margin convex. The carinal margin is sinuous, the upper part being concave, the lower somewhat convex.

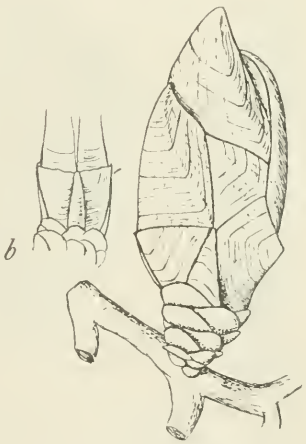


FIG. 21.—SCALPELLUM MICRUM × 8, WITH DETAIL VIEW OF ROSTRUM, *b*.

The carina is short, simply arched, with an apical mucro. The roof is rounded, passing directly into the narrow sides; it is transversely marked with deeply arcuate growth-lines. The apex reaches to the upper third of the length of the carinal margin of the tergum. The base is rounded.

The upper latus is trapezoidal with straight margins, the carinal margin nearly half as long as the scutal, the tergal and basal margins about equal. The apex is terminal at the scuto-tergal angle.

The well-developed rostrum forms a band about one-fifth as wide as long, and slightly narrower above than at the base. It extends the whole length of the adjacent latera.

The rostral latus is triangular, with the basal angle of the triangle truncated. The three sides are about equal, the two upper angles also equal.

The inframedian latus is narrow, triangular, its height equal to that of the rostral latus, and about double the basal width. The umbo is apical.

The carinal latus is irregularly pentagonal, widest above the middle, exceeding in area the upper and the rostral latera. The upper lateral and carinal facets are equal and straight, the lower lateral longer, straight, and the subcarinal margin still longer, concave. The basal margin is shortest. The umbo projects angularly beyond the carina. In dorsal aspect the two carinal latera are seen to meet below the carina in a straight suture as far up as their umbones.

The peduncle is very short, covered with large imbricating scales in five rows of four scales each.

Length of the capitulum 5, breadth 2.5 mm. Length of the peduncle 1.3 mm. Length of the carina 3.2 mm.

This minute form is notable for the length of the plates of the lower whorl, especially of the carinal latera, and for the shortness of the carina. It is closely related to *S. brevicarinatum* Hoek, but in that antipodal species the whole capitulum is more lengthened, the greatest breadth being decidedly less than half of the length. The tergum is longer, the rostral lateral narrower and wedge-shaped, and the subcarinal margin of the carinal latus is slightly convex. The roof of the carina in *S. brevicarinatum* is described as "not quite flat;" but in the present species it is strongly convex. *S. micrum* is known by a single individual, which occurred with *Scalpellum longicarinatum*. (Fig. 21.)

SCALPELLUM FORMOSUM, new species.

Type.—Cat. No. 8975, U.S.N.M.

Type-locality.—*Albatross* Station 2097, east from the mouth of Chesapeake Bay, north latitude 37° 56′ 20″, west longitude 70° 57′ 30″, in 1,917 fathoms, Globigerina ooze.

Other localities.—*Albatross* Station 2205, south of Marthas Vineyard, in latitude 39° 35′ north, U.S.N.M. Cat. No. 32897.

The capitulum is composed of 13 (or 14?) wholly calcified plates. Ventral margin convex. The plates are sculptured with low, widely spaced, narrow wrinkles or ridges in the direction of lines of growth, and fine, distinct, and close riblets radiating from the umbones. The cuticle is very thin and sparsely clothed with rather long delicate hairs. Sutures are linear.

The scutum is trapezoidal, more than half as wide as long. Occludent margin convex; tergal, lateral, and basal margins are straight, the basal shortest. There is a curved diagonal riblet from apex to baso-lateral angle, stronger than the other radii. The acute umbo lies slightly within the ventral margin.

The tergum is triangular, with almost perfectly straight sides. It is about 1½ times the length of the scutum and more than twice as long as wide.

The carina is evenly and strongly curved, with apical umbo. The roof is flat, bounded by narrow but rather high lateral ribs. The sides are wide and strongly sculptured with oblique riblets, which are a little irregular or crenulate. The basal margin is straight.

The upper lateral plate is quadrangular, the scutal and carinal margins straight and parallel. The scutal margin is more than twice as long as the carinal. The tergal and basal margins are straight, subequal, and shorter than the scutal. The umbo is terminal.

There seems to be a triangular rostrum, wholly covered by the rostral latera, but visible in the type-specimen by reason of the broken apices of these latera. The specimen being unique, could not be further investigated to make certain the actual conditions.

The rostral latus is trapezoidal, more than half as high as long. The ventral margins of the two plates are straight and in contact. The basal margin is quite short, and probably in part covered by the inframedian plate. The scutal margin is long and straight.

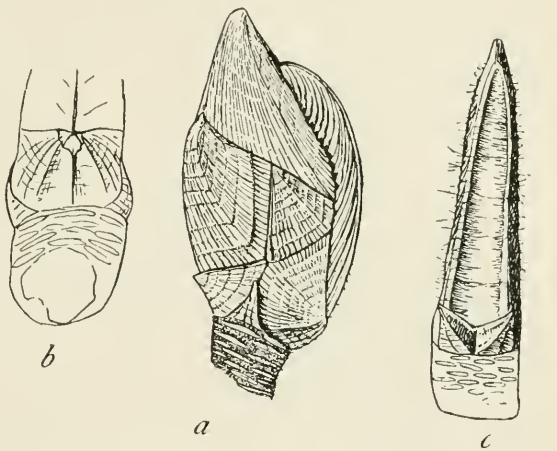


FIG. 22.—SCALPELLUM FORMOSUM × 3. *a*, LATERAL VIEW; *b*, DETAIL OF ROSTRUM; *c*, CARINAL VIEW.

The inframedian latus is narrowly triangular, a little contracted near the obtuse apex. The basal margin is about half as long as the plate. The rostral and carinal latera are in contact for a very short distance above the inframedian plate.

The carinal latus is large and irregularly rhombic. The dorsal margin is curved and projects slightly from the dorsal outline below the base of the carina. The two plates meet below the carina in a straight suture. The umbo does not project and is situated at the base of the carina below the middle of the dorsal outline of the plate. Several beaded ribs radiate from the umbones to the lower and dorsal margins of the plates.

The very short peduncle is covered with narrow, transversely elongated scales, and clothed with a hairy cuticle.

Length of the capitulum 14, breadth 7.5 mm. Length of the peduncle 2.7 mm. Length of the carina 10.7, diameter at base 2.5 mm.

This handsomely sculptured species is represented by a single example from the type locality. It belongs to a group comprising *S.*

vitreum Hoek of the Pacific, *S. curvatum* Gruvel, *talismani* Gruvel, and *S. rigidum* Aurivillius of the northeast Atlantic (Azores to the Gulf of Gascony). *S. formosum* stands nearest *S. talismani*, but differs by the longer inframedian lateral plate (which in *talismani* is in form of an isoceles triangle), the lower rostral latera, and the somewhat different sculpture of the carinal latera.

From Station 2205 only the detached valves of a macerated specimen are preserved. It is larger than the type, the carina measuring 18.5 mm. long, 3.3 wide. The sculpture is very sharp and beautiful. The dorsal faces of the carinal latera are radially tricostate. (Fig. 22.)

SCALPELLUM GRACILE, new species.

Type.—Cat. No. 32908 U.S.N.M.

Type-locality.—*Albatross* Station 2791, off Chile, south latitude 38° 08′, west longitude 75° 53′, in 677 fathoms; bottom temperature, 37.9° F.

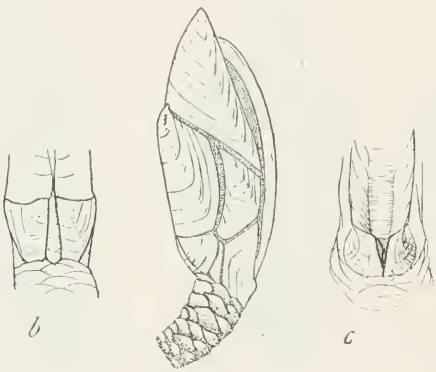


FIG. 23.—SCALPELLUM GRACILE × 4, WITH *b*, DETAILS OF ROSTRUM, AND *c*, CARINA.

The capitulum is slenderly oval, widest in the middle, the ventral and dorsal borders equally curved, base narrow. It is composed of 14 wholly calcified plates, the upper lateral plates and carina separated by chitinous spaces from the others. Cuticle very thin and smooth. Most of the plates show very faint radial striation.

The scutum is wider at and above the middle than toward the base. The occludent margin is straight except near the apex, where it curves inward. The lateral margin is somewhat convex. The umbo is at the acuminate apex, which overlies the adjacent angle of the tergum.

Tergum longer than the scutum, triangular, the occludent and basal margins about equal in length, the former convex, the latter straight. The carinal margin is straight. Apex erect.

The carina is long and evenly arched, with apical umbo. The roof is convex, between two high lateral ribs. The sides are narrow, but widest near the apex.

The upper lateral plate is about as wide as the scuta, quadrangular, with the scutal and carinal borders parallel, the carinal about half as long as the scutal; basal and tergal margins are straight and about equal in length. The umbo is acute and apical.

The rostrum is very narrow and long, a trifle wider toward the base. It separates the rostral latera throughout.

The rostral latus is quadrangular, about as high as wide. The basal margin is much shorter than the scutal, the rostral and lateral margins subequal and diverging upward. The scuto-lateral angle is truncated and rests against the upper latus.

The inframedian latus is extremely narrow, almost linear. The upper end curves slightly toward the scutum, and the base is a trifle widened. The umbo is not distinct, but presumably apical.

The carinal latus is shaped like the upper latera, much higher than wide. The carinal margin is double the length of the scutal and parallel to it. At its lower fourth the umbo projects slightly beyond the carina. The basal and upper margins are very oblique and straight.

The peduncle is short, with about eight rows of six large, transversely lengthened scales each.

Length of the capitulum 9.5, breadth 3.5 mm.; length of the peduncle, 2.3 mm. Length of the carina 7.5, diameter at base 1 mm.

This slender and graceful species resembles *S. planum* Hoek, a species without a rostral plate. It is also somewhat like *S. brevicarinatum* Hoek, but in that the carinal latera differ widely. A single specimen was taken. (Fig. 23.)

SCALPELLUM ANTILLARUM, new species.

Type.—Cat. No. 9682 U.S.N.M.

Type-locality.—*Albatross* Station 2384, Gulf of Mexico, north latitude 28° 45′, west longitude 88° 15′ 30″, in 940 fathoms; bottom temperature, 39.6° F.

The capitulum is long-oval, widest in the middle, tapering toward both ends; composed of 13 or 14 wholly calcified plates. The occludent and dorsal margins are about equally convex. The very thin cuticle is somewhat hairy on the carina, sutures, and peduncle. The plates are sculptured with widely spaced wrinkles in the direction of growth-lines, and there are some extremely faint radial striæ.

The scutum is irregular in shape, the lower half wider than the upper. Occludent margin convex; lateral margin weakly sigmoid. The basal margin is straight, and the apex acuminate and a little recurved, overlying the lower angle of the tergum.

The tergum is triangular, a little longer than the scutum, with nearly straight margins and an erect apex.

The carina is long and evenly arcuate, with apical umbo. It extends between the carinal latera to the peduncle. The roof is flat, bounded by acute angles, which toward the upper part project a little, forming narrow marginal ribs. The sides are narrow.

The upper latus is obliquely spatulate, the scutal margin longest, concave; tergal margin straight. Carinal margin shorter than that against the carinal latus. The basal point is directly above the infra-

median latus. The inconspicuous umbo is at the upper fourth, in the narrow portion of the plate.

The rostrum is represented by a linear vestige almost concealed in the cuticle.

The rostral latera are subquadrate. The occludent and scutal margins are straight, nearly equal, and at right angles. The basal margin is not much more than half as long as the scutal; and the lateral margin is weakly sigmoid.

The inframedian latus is small, narrowly triangular, about half the height of the rostral latera. The basal margin is scarcely half the total length of the plate. Umbo at the obtuse apex.

The rostral latus is twice as high as wide, with four unequal sides, no two of them parallel. The umbo is at the lower sixth of the straight carinal margin, and hardly projects beyond the carina. The carinal margin is longest, basal and lateral short and nearly equal. The upper angle is acute.

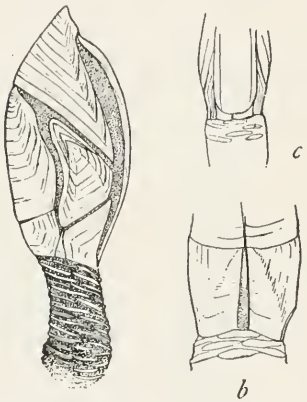


FIG. 24.—SCALPELLUM ANTILLARUM × 3, WITH DETAILS OF *b*, ROSTRUM AND *c*, CARINA.

The peduncle is very short, with about eight rows of eight transversely lengthened, narrow scales each, the intervals hairy.

Length of capitulum 11, breadth 5.7 mm. Length of peduncle 4.5 mm. Length of the carina 10, diameter at base 1.1 mm.

There is some uncertainty about the number of plates, since the rostrum is so inconspicuous that it may readily be overlooked. When so reduced as in this species it is likely to be absent in some individuals.

A single example was taken. The peculiar shape of the upper latus and the very long carina, which passes between and entirely separates the carinal latera, are its more conspicuous features. (Fig. 24.)

SCALPELLUM SEMISCULPTUM, new species.

Type.—Cat. No. 9888, U.S.N.M.

Type-locality.—*Albatross* Station 2397, Gulf of Mexico, north latitude 28° 42′, west longitude 86° 36′, in 280 fathoms, gray mud.

The capitulum is about twice as long as wide, widest at the middle, the occludent margin nearly or quite as much arched as the carinal; composed of 13 fully calcified plates joined by linear sutures. The cuticle is very thin and smooth. The plates are marked with lines of growth and fine, inconspicuous radial striæ, but the carinal latera have distinct and strong radial riblets.

The scutum is about twice as long as wide, rhomboidal, with acute apical umbo. The occludent and lateral margins are subparallel and somewhat convex. The tergal margin is concave, the basal straight.

The tergum is triangular, conspicuously larger than the scutum. The occludent margin is about three-fourths as long as that of the scutum and is strongly arched, the acute summit being thus somewhat recurved. The scutal margin is a little longer than the occludent; the carinal margin is a little hollowed near the apex, elsewhere convex.

The carina is long and equably curved, its apical umbo at about the upper fourth of the carinal margin of the tergum. The roof is flat

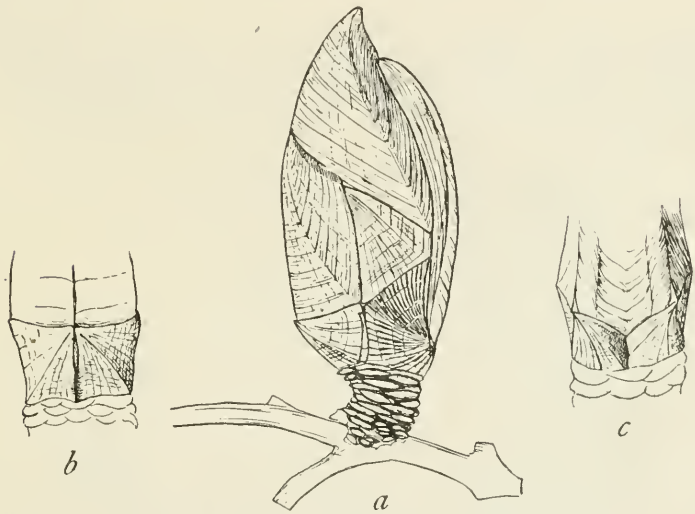


FIG. 25.—SCALPELLUM SEMISCULPTUM ×3, WITH DETAILS OF ROSTRUM *b*, AND CARINA, *c*.

between low but strong bordering ribs. The sides are narrow below, wider above; basal margin convex.

The upper latus is trapezoidal, the scutal margin concave, carinal margin very short, about one-third the length of the scutal. The tergal and basal margins are about equal and straight. The umbo is terminal; a narrow rib runs from it to the baso-carinal angle. The plate is finely, rather sharply striate radially.

There is no rostrum, or merely a sunken linear rudiment. The rostral latus is as high as wide, the basal margin very much shorter than the others; scutal margin straight, horizontal. The umbo projects a little at the upper occludent angle. From it a narrow diagonal rib runs to the lower lateral angle, the surface below this rib being radially striate. The two rostral latera rise in a low welt or irregular ridge at their occludent suture.

The inframedian latus is very narrow, almost linear, and about as long as the adjacent border of the rostral latus. It curves above

slightly toward the rostral border. The umbo is probably apical, but it is not readily visible.

The carinal latus is irregularly trapezoidal, perhaps a little greater in area than the upper latus. The basal and lateral margins are about equal, the oblique upper margin a little longer. The obtuse umbo is at about the lower third of the carinal margin. It does not project beyond the carina. The plate is sculptured with strong radial riblets. In dorsal view the carinal latera are seen to be strongly tricostate, and meet in an irregular suture.

The peduncle is very short, closely covered with large, projecting, transversely lengthened scales, in about eight rows of eight scales each.

Length of the capitulum, 16; breadth, 7.7 mm. Length of the peduncle, 3 mm. Length of the carina, 12.5; diameter at base, 2.5 mm.

The linear inframedian latus and the strong radial sculpture of the carinal latus are the more striking characters of this species. It is most nearly related to *S. aurivillii*, but differs in numerous particulars, as set forth in the key to species. (Fig. 25.)

SCALPELLUM AURIVILLII, new species.

Type.—Cat. No. 32865 U.S.N.M.

Type-locality.—*Albatross* Station 2731, off Cape Hatteras, north latitude 36° 45′, west longitude 74° 28′, in 781 fathoms, growing on *Scalpellum volutinum*.

Other localities.—No. 12286, *Albatross* Station 2728, north latitude 36° 30′, west longitude 74° 33′ in 850 fathoms. No. 11757, *Albatross* Station 2710, north latitude 40° 06′, west longitude 68° 01′ 30″, in 984 fathoms. No. 9026, Fish Commission Station 1123, off Marthas Vineyard, 787 fathoms, bottom temperature 39° F., on *Acanella*. No. 10779, *Albatross* Station 2529, north latitude 41° 03′ 30″, west longitude 66° 14′, in 662 fathoms, gray mud, bottom temperature 38.7° F.

The capitulum is rhombic-oblong, twice as long as wide, the ventral margin slightly convex; composed of 13 fully calcified plates. Cuticle very thin and smooth. Sutures linear. The plates are marked with fine, irregular lines of growth, and minute, inconspicuous radial striæ.

The length of the scutum is somewhat more then twice its greatest width. The occludent margin is straight except near the apex, where it bends back. The lateral margin is concave below the tergo-internal angle, becoming convex in the middle. The basal margin is nearly straight, and forms an angle slightly less than a right angle with the occludent margin. The plate is widest in the middle. The acute apex is recurved within the ventral border.

The tergum is much longer and wider than the scutum, triangular. The occludent margin is convex, nearly three-fourths as long as the

straight scutal margin. The carinal margin is very weakly sigmoid, concave above, convex below. The umbo is a trifle recurved.

The carina is simply arched, more strongly so above; umbo terminal. The roof is flat with distinct bordering ribs. The sides are moderately developed near the umbo, but very narrow elsewhere. The basal margin is straight, as are the fine lines of growth across the roof.

The upper lateral plate is trapezoidal, the scutal margin much the longest, concave. The other margins are straight, the carinal shortest, less than half as long as the scutal. The apex is produced in a small triangle above and beyond the umbo, which is acute and marginal, on the scutal side.

There is no rostrum.

The rostral latus is quadrangular, about as high as wide. The ventral and scutal borders are straight, the basal very short. The upper

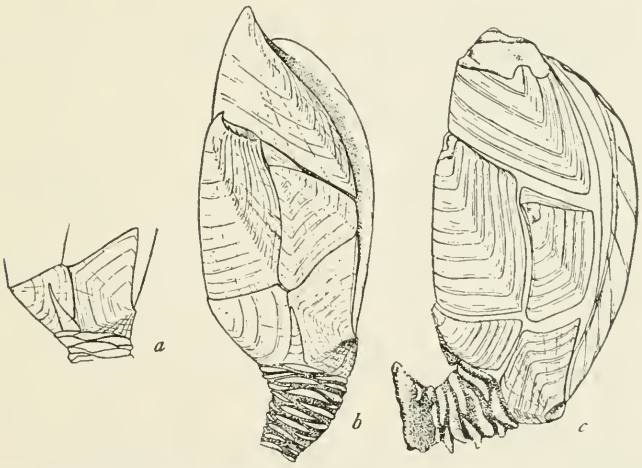


FIG. 26.—SCALPELLUM AURIVILLII. *a*, *b*, LATERAL VIEWS × 3; *c*, S. AURIVILLII, INCERTUM LATERAL VIEW × 2.

interior angle is truncated where it comes in contact with the upper latus for a short distance. The carinal margin is in contact with the carinal latus, but the suture is more or less covered by the extremely narrow inframedian latus, which overlies the borders of the plates.

The inframedian latus is very narrowly triangular, being wider at the base. The umbo is apical. It overlies the suture instead of occupying a space between the rostral and carinal latera. It is often abnormal, as noted below.

The carinal latus is twice as high as wide, quadrangular, the umbo at its lower third not projecting beyond the carina. The basal and rostral margins are subequal, straight, and at right angles. The carinal margin is nearly straight, projecting a little in the lower third.

The two latera meet below the carina. From the umbo a conical, raised, and radially costulate area extends to the basal margin.

The peduncle is very short, compactly covered with narrow transversely elongate scales, in eight rows of about eight scales each.

Length of the capitulum 15.3, breadth 7.5 mm. Length of the peduncle 5 mm. Length of the carina 13.5, diameter at base 2.2 mm.

The mandible (Plate V, fig. 15) has four teeth, unequally spaced, the lowest one ending in a group of about five small spines. The maxilla has a pair of stout spines at the upper angle, the face notched below them, with a double row of spines.

The first cirrus has unequal rami of eight and nine segments, those of the anterior ramus wider and shorter. It is densely hairy. The second cirrus is like those following, but a little shorter. The sixth cirrus has segments with four pairs of spines, the anterior one in each pair longer. The upper or distal group on each segment usually has three large spines instead of two. The posterior side has a pair of spines at the distal angle, one large, the other small, and on the outer cirrus there is a spine nearly midway between sutures. Fig. 9 of Plate IV represents an intermediate segment from the outer ramus of the sixth cirrus, the anterior side toward the right.

The caudal appendage (Plate IV, fig. 13) consists of five long segments and terminates in a group of three very long spines and one or two small ones. Length including spines is about 2.8 mm.

This species is related to *S. talismani* Gruvel and its allies, but differs by the very weak or hardly noticeable radial sculpture. Its nearest relative is *S. semisculptum*, a form in which the entire carinal latus is radially sculptured, and the carina has wider sides, stouter lateral ribs, and angular, V-shaped striæ on the roof.

Nine individuals from five stations between Cape Hatteras and Marthas Vineyard are in the collection. One of three in the type lot has the inframedian latera on both sides bent strongly towards the ventral margin, over the rostral latera (fig. 26 *a*). In another example, from Station 2728, these latera are bent towards the dorsal border, overlying the carinal latera. It would seem that, since these plates are crowded out of their normal place, their growth is likely to be uneven, and a large proportion of abnormal individuals results.

The largest individual has a capitulum 18 mm. long (Station 2728); but this size is attained at no other station, and some apparently mature capitula are only 12 mm. long.

This species is named for C. W. Aurivillius, author of an excellent paper upon North Atlantic, Arctic, and Oriental cirripedes. (Fig. 26*a*, *b*.)

SCALPELLUM AURIVILLII INCERTUM, new subspecies.

A single example (Cat. No. 32871, U.S.N.M.), evidently very closely related to *S. aurivillii*, was found growing on the peduncle of one of a series of *S. regium* var., said to be from *Albatross* Station 3342, off British Columbia, in 1,588 fathoms. Having been preserved probably in formaldehyde, the apices of the valves are more or less eroded, especially those of the terga. Allowing for this the length of the capitulum would be 24, breadth 13.5 mm.; length of the peduncle 7.5 mm. Length of the carina 22, diameter at base 3 mm. The plates are pale cream-colored, smoothish, except for narrow, widely spaced growth-arrest marks. On the roof of the carina the growth lines arch downwards. The upper latus is larger than in *S. aurivillii*, its length being twice the breadth, and its carinal margin is decidedly longer than in *S. aurivillii*. On the right side of the capitulum there is no inframedian latus and no indication that there ever was one, and on the left side only a small basal triangular plate; but the absence of these plates may be due to the action of the formalin, though I can not positively affirm that this is the case. The rostral latus is comparatively lower and wider, its greatest height only half the width. No rostrum. In other characters of the plates there is no important divergence from *S. aurivillii*, except for the size, which is much greater than that of any of the series of apparently adult examples of that species. (Fig. 26 *c*).

The mandible (Plate V, fig. 3) has teeth more slender than those of *S. aurivillii*, the lower point slenderer, with a group of about eight very minute points or spines.

The maxilla (Plate V, fig. 9) has a pair of stout upper spines, a notch below them. The other spines are shorter and not very numerous.

The first cirrus has unequal rami of eight and eleven segments. The other cirri do not differ materially from those of *S. aurivillii*. The terminal appendage is about as long as in *S. aurivillii* (the individual being much larger), and seems to consist of but three segments, the last terminating in two long spines and one short one.

SCALPELLUM GALAPAGANUM, new species.

Type.—Cat. No. 32864, U.S.N.M.

Type-locality.—*Albatross* Station 2808, off the Galapagos Islands, south latitude 00° 36′ 30″, west longitude 89° 19′, in 634 fathoms, bottom temperature 39.9°.

The capitulum is long and slender, the length more than double the breadth; much compressed. The ventral margin is nearly straight from base to apex of the tergum. It is composed of 13 (or 14, count-

ing the excessively rudimentary rostrum) fully calcified plates, which are smooth except for faint growth lines and very inconspicuous radial striæ. Cuticle hardly perceptible, smooth. Sutures linear.

The scutum is more than twice as long as wide, with slightly convex occludent and lateral margins. It is widest at the middle. The basal margin is at right angles to the occludent. The tergal margin is very oblique.

The tergum is triangular, conspicuously longer than the scutum and much greater in area. Its occludent and basal margins are subequal and straight. The upper half of the carinal margin is straight, the lower half convex. The apex is erect.

The carina is long, rather strongly arched in its upper half, less so in the lower half.

The umbo is apical. The roof widens rapidly downwards; at first, near the apex, it is convex, but it soon becomes flat, and even a trifle concave near the base, with bluntly angular borders. The sides are quite wide in the apical third, but very narrow and a little turned in in the lower two-thirds. The basal margin is convex.

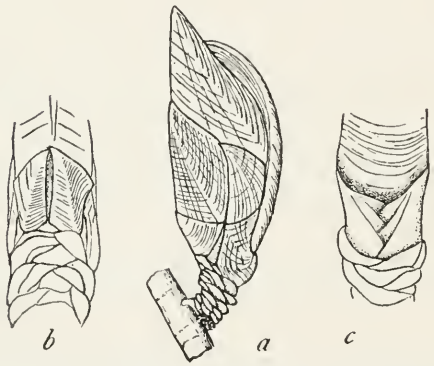


FIG. 27.—SCALPELLUM GALAPAGANUM. *a*, LATERAL VIEW, × 4, WITH *b*, DETAILS OF ROSTRUM, AND *c*, CARINA.

The upper lateral plate is quadrangular, the scutal margin longest, concave, the beak or umbo at its upper end encroaching a little upon the scutum. The tergal margin is a trifle convex, and slightly longer than the carinal. The basal angle of the upper lateral plate meets the baso-lateral angle of the scutum, and the upper interior angles of the rostral, inframedian and carinal latera; the sutures all radiating from a common center.

The rostrum in most examples (as in the figured type) is a distinct linear plate, clearly visible, though very narrow. In some examples it is hardly to be made out. The rostral latus is about as high as wide, quadrangular, the ventral and lateral margins nearly equal and diverging upwards, the basal very short, about half the length of the others, the scutal margin longest, slightly concave. The umbo has a tendency to project slightly at the ventral border.

The inframedian latus is as long as the adjacent border of the rostral latus, extremely narrow, wider at the base. Umbo at the apex.

The carinal latus is long and narrow, its length fully twice the width. The upper half of the carinal margin is straight, where in contact with the sides of the carina; the lower half is convex, project-

ing beyond the carina, the umbo being at the junction of the straight and convex portions. The other three facets of the plate, resting respectively against the peduncle, the inframedian latus and the upper latus, are straight and about equal. Posteriorly the two carinal latera are tricostate below the base of the carina, meeting there in a zigzag suture.

The peduncle is very short, conic, and covered with large imbricating scales, in eight rows of five or six scales each.

Length of the capitulum 9, breadth 3.5 mm. Length of the peduncle 1.5 mm. Length of the carina 7.2, diameter at base 1.4 mm.

This little species is narrower than any closely related forms. *S. gracile* has a much better developed rostrum, the occludent border is convex, and the carina differs. The very narrow inframedian lateral plate and the peculiar shape of the carina are also characteristic. A colony of eight individuals, three of them young, was grouped upon a slender stem, perhaps of a gorgonian. (Fig. 27.)

VI. Section NEOSCALPELLUM, new section.

Plates of the capitulum only partially calcified, the calcareous portion of the tergum V-shaped; inframedian latus narrow, higher than wide; scutum with apical umbo. Type, S. dicheloplax.

This section was established by Hoek in his memorable Challenger Report, though it was not named at that time.

The primary division in his key into species with the lower whorl of plates perfectly, and those with them imperfectly calcified is faulty, since it would separate immature from adult forms of the same species. (See *S. larvale* on page 78.) It remains to be seen whether the group is a natural one or whether it consists of species derived from several phyla. A comparative study of series of young individuals may throw light upon this inquiry, since these retain an earlier form of the plates. Hoek found the complemental males of *Scalpellum marginatum* (a species falling into the first division of my key) more degenerate than those of *S. intermedium*, a species of my second division.

S. inerme Annandale is certainly not related to species of either division of this section. It represents a parallel line of differentiation from *S. stearnsii* Pilsbry, as Hoek has already recognized. Imperfectly calcified species occur in other phyla, such as *S. patagonicum*, belonging to *Scalpellum s. str.*, and *S. giganteum*, a species of *Holoscalpellum*.

KEY TO SPECIES.

a. Carina with the narrow roof deeply guttered between high lateral ribs; the other plates with the calcified portions biramose or triramose (group of *S. dicheloplax*.)

b. Scutum bifurcate at the base. Pacific ..... *S. phantasma.*

bb. Scutum entire basally. Atlantic.....*S. dicheloplax.*

aa. Carina with the roof flat or but slightly concave; rostral latera narrow and simple.

b. Umbo of the carina close to the apex; upper latus narrow, irregularly lunate; scutum without a tergal calcified branch, the base bifurcate. Pacific coast. *S. larvale.*

bb. Umbo of the carina close to the apex; upper latus ∧-shaped; lateral plates of the lower whorl triangular, the inframedian latus very small. Japan. *S. nipponense.*

bbb. Umbo of the carina at the upper third or fourth of the plate; upper latus wide, spatulate or subtriangular; scutum entire basally; inframedian latus very narrow.

c. Umbones of carina and carinal latera prominently projecting. Atlantic. *S. imperfectum.*

cc. Umbones of carina and carinal latera hardly modifying the dorsal contour. Pacific coast.....*S. sanctabarbarae.*

GROUP OF SCALPELLUM DICHELOPLAX.

SCALPELLUM DICHELOPLAX, new species.

Type.—Cat. No. 11951, U.S.N.M.

Type-locality.—*Albatross* Station 2711, north latitude 38° 59′, west longitude 70° 07′, in 1,544 fathoms.

Other localities.—No. 32862, Station 2222, north latitude 39° 03′ 15″, west longitude 70° 50′ 45″, in 1,537 fathoms, bottom temperature 36.9°. Nos. 8030, 8631, *Albatross* Station 2221, north latitude 39° 05′ 30″, west longitude 70° 44′ 30″, 1,525 fathoms, bottom temperature 36.9°.

The capitulum is irregularly ovate and strongly compressed, composed of 13 very imperfectly calcified plates. The occludent and carinal margins are strongly and about equally convex. The plates are all biramose or V-shaped, with the exception of the carina. The cuticle is smooth, without pubescence or hairs.

The scutum has a wide convex occludent and a very narrow, curved tergal calcified segment. The former is widest at the base, tapering to about one-third that width in the upper portion. The surface is sculptured with low, narrow, widely spaced riblets parallel to the basal margin. The occludent margin is strongly convex; the umbo is terminal at the apex, which is recurved within the ventral outline and overlies the base of the tergum.

The tergum is V-shaped, having a curved occludent branch about twice as wide as the long, slender, and curved carinal branch. This is nearly twice the length of the occludent branch. The apex is acute and somewhat recurved.

The carina is strongly arched, more so above. The umbo turns inward, but is not quite terminal, a flattened continuation of the sides extending beyond it. The roof is very deeply channeled, with high,

narrow bordering ribs. The sides are rather narrow and of nearly equal width throughout.

The upper lateral plate is irregularly hexagonal, with the calcified portion broadly V-shaped, the two branches nearly equal, somewhat curved. A narrow appendage or third branch arises at the apex and runs toward the tergum in a direction at a right angle to the tergal branch.

There is no rostrum.

The rostral lateral plate is V-shaped, the basal branch of the V being shorter and wider.

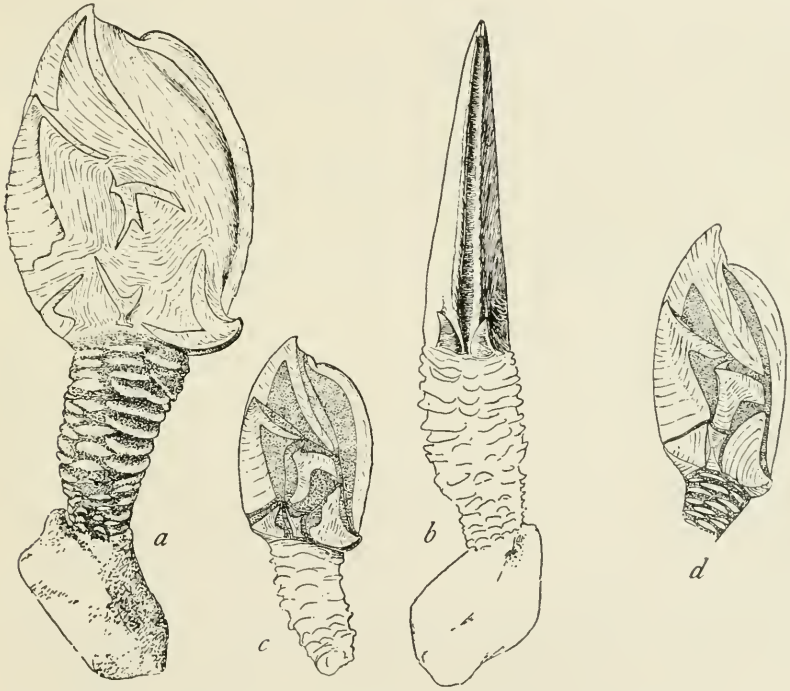


FIG. 28.—SCALPELLUM DICHELOPLAX. *a*, *b*, LATERAL AND CARINAL VIEWS OF THE TYPE, NATURAL SIZE; *c*, YOUNG INDIVIDUAL, NATURAL SIZE; *d*, S. DICHELOPLAX BENTHOPHILA × 2.

The inframedian latus is quadrangular. The rostral border is longest, a little concave near the base, convex above. The upper angle rests against the scutum. The oblique upper margin is a little concave, larger than the basal margin, and about the same length as the carinal. The straight basal margin is fully half as long as the rostral. The carinal margin is a trifle concave. The calcified portion is somewhat wineglass-shaped, being very narrow below the middle. The base is a little expanded, and the upper part composed of two diverging branches, that toward the scutum longer. The umbo is at or below the lower fourth in the adult stage, but higher in the young.

The carinal latus is broadly V-shaped, the carinal branch of the V larger and curved. The umbones are recurved and project below and beyond the carina.

The peduncle is shorter than the capitulum, clothed with very large, strongly projecting scales in seven rows of about twelve scales each.

Length of capitulum 44, width 31 mm.; length of peduncle, 24 mm.; length of the carina 42, diameter at base 4.5 mm. (Fig. 28*a*, *b*.)

A half-grown individual from the type lot is figured to show the true forms of the plates, the sutures between the chitinous, uncalcified bordering portions being visible as white lines at this stage of growth. In the drawing these sutures are represented by black lines. The original outlines of the plates approach the contours of species of the *S. scalpellum* group. (Fig. 28*c*.)

The oldest specimen of the type lot measures—length of capitulum 43, of peduncle 34 mm. The peduncle has seven rows of about seventeen scales each.

This is the largest of the imperfectly calcified species of *Scalpellum*. It is remarkable for the great reduction of the plates and their peculiar forms. It is related to *S. marginatum* Hoek, from off New Guinea, but the plates are more reduced, the upper latera have a different shape, and all the plates of the lower whorl differ somewhat in the two species.

Scalpellum edwardsi Gruvel, described from a single specimen dredged by the *Talisman* near the Azores in 4,255 meters, stands close to *S. dicheloplax*, and further collections are needed to fully elucidate their relations. The unique type of *S. edwardsi* has a capitulum 25 mm. long. The plates of the lower whorl are completely calcified, while the scuta, terga, and upper latera are like those plates in *S. dicheloplax*. In the smallest specimen of *S. dicheloplax*, capitulum 28 mm. long, the lower plates are almost wholly calcified (fig. 28*c*), approaching the condition of *S. edwardsi;* but the umbo of the inframedian lateral plate is situated higher. The chief difference is in the shape of the inframedian lateral plate. In *S. edwardsi*[a] the upper margin of this plate is longest, concave, and the basal part of the plate is extremely narrow—quite unlike the shape in *S. dicheloplax*. Moreover, the carina of *S. edwardsi* is described as with a flat roof bordered by two distinct but not very pronounced lateral ridges, and with the sides especially well developed in the upper part, while in the young as well as the adult *S. dicheloplax* the roof has a deep concave channel between two very high bordering ribs, and the sides are not wider above than elsewhere.

Whether the type of *S. edwardsi* is an adult form, and if not, what subsequent changes take place, are questions remaining to be ascertained. It is evidently distinct specifically from *S. dicheloplax*.

[a] Expéd. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 63.

Compared with *S. phantasma*, of California, it is seen that *S. dicheloplax* at no stage of growth has the base of the scutum bifurcate, the umbo of the carinal latus is recurved, and all the plates of the lower whorl differ somewhat in shape, the upper calcified rami of the rostral and carinal latera ascending less than in *S. phantasma*.

SCALPELLUM DICHELOPLAX BENTHOPHILA, new subspecies.

Type.—Cat. No. 32878, U.S.N.M.

Type-locality.—*Albatross* Station 2042, north latitude 39° 33′, west longitude 68° 27′, between Cape May and Nantucket, 1,555 fathoms.

The capitulum is more lengthened than in *S. dicheloplax*, its length twice the breadth. The carina is less arcuate with wider sides, and separated from the tergum by a much narrower chitinous suture. The plates of the lower whorl are completely calcified, and the inframedian lateral plate is narrower, with central umbo. The scuta, terga, and upper lateral plates are V-shaped, with comparatively shorter, wider branches than in *S. dicheloplax*. (Fig. 28*d*.)

Length of capitulum 15, width 7.5; length of peduncle, 4.5 mm.

The much more extensive calcification of the plates in the single example of this subspecies, as compared with *S. dicheloplax*, may be due to youth; but the narrower shape of the whole capitulum, the narrower inframedian latera, and the reduction of the chitinous space between carina and tergum are features which render it advisable to distinguish this form by name. It requires comparison with specimens of *S. dicheloplax* of equally small size, which are unfortunately not yet in our possession.

SCALPELLUM PHANTASMA Pilsbry.

1907. *S. phantasma* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 194, pl. vi, fig. 1.

Type-locality.—Off Santa Catalina Islands, California, 2,196 fathoms.

GROUP OF SCALPELLUM NIPPONENSE.

SCALPELLUM NIPPONENSE, new species.

Type.—Cat. No. 32909, U.S.N.M.

Type-locality.—*Albatross* Station 3697, off Manazuru-zaki, Japan, between 120 and 265 fathoms.

The capitulum is elliptical, the length more than double the breadth, with both ventral and dorsal margins convex; covered with a very thin, smooth cuticle. It is composed of 13 imperfectly calcified plates, which are lightly marked with growth lines.

The scutum is subtriangular, the length nearly 2½ times the greatest breadth. The occludent margin is somewhat convex. The summit is acuminate, a little recurved, and overlies the base of the tergum.

Near the apex on the lateral side there is a small rounded lobe; elsewhere the lateral margin is nearly straight. The basal margin is straight and oblique.

The calcified portion of the tergum is V-shaped, the occludent branch six-tenths the length of the carinal, which is much longer than the scutum, and acute distally. The apex is erect and acute.

The carina is evenly arcuate, with subterminal umbo. The roof is flat, bounded by angles. The sides are narrow, a trifle wider near the apex.

The calcified portion of the upper lateral plate is V-shaped, the tergal branch about two-thirds as long as the scutal. Both branches are rounded distally. The scutal margin is noticeably concave near the apex. The umbo is acute, curved toward the scutum, and a small rounded calcified lobe extends beyond it.

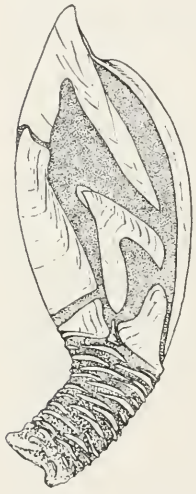


FIG. 29.—SCALPELLUM NIPPONENSE. LATERAL VIEW, × 3.

There is no rostrum.

The rostral latus is wedge-shaped, narrower ventrally, about twice as long as high.

The inframedian latus is minute, narrowly triangular, with apical umbo.

The carinal latus is triangular, the basal margin straight, shorter than the others. The lateral margin is concave, the carinal margin nearly straight. The umbo projects a trifle backward and laterally, at the baso-carinal angle of the plate, and against the base of the carina.

The peduncle is short, with eight rows of about eight narrow and transversely elongated, non-imbricating scales.

Length of the capitulum 15, breadth 7.3 mm.; length of peduncle 6 mm.; length of the carina 13.5, diameter at base 1.7 mm.

Of this species a single specimen was taken. It is related to *S. japonicum* Hoek, but differs conspicuously by the shapes of the upper and the inframedian lateral plates, and the much narrower carina, as seen in dorsal view, the basal width of the roof being only about one-eighth of its length. Moreover, the summits of the terga are recurved in *S. japonicum*, erect and nearly straight in *S. nipponense*. *S. intermedium* Hoek, from the South Pacific, described from a specimen with the capitulum 9 mm. long, stands close to *S. nipponense*, its more fully calcified plates being a character which would certainly be found in the young of the Japanese species; yet from the different relative sizes of the lower plates, I think the two forms are specifically distinct. (Fig. 29.)

GROUP OF SCALPELLUM GRUVELI.

SCALPELLUM IMPERFECTUM, new species.

Type.—Cat. No. 32914, U.S.N.M.

Type-locality.—*Albatross* Station 2731, northeast from Hatteras, north latitude 36° 45′, west longitude 78° 28′, 781 fathoms, seated on *Scalpellum velutinum* Hoek.

Other localities.—Cat. No. 12891, Station 2741, east of mouth of Chesapeake Bay, north latitude 37° 44′, west longitude 73° 57′, 852 fathoms. Cat. No. 9007, Station 2196, north latitude 39° 35′, west longitude 69° 44′, in 1,230 fathoms green mud, on an Echinoderm spine.

The capitulum is composed of 13 valves, those of the upper whorl imperfectly calcified. The valves are joined by wide, chitinous sutures. The scutal and carinal margins are regularly convex throughout. The apex is obtuse. The cuticle is thin and smooth, and the plates are weakly marked with growth lines.

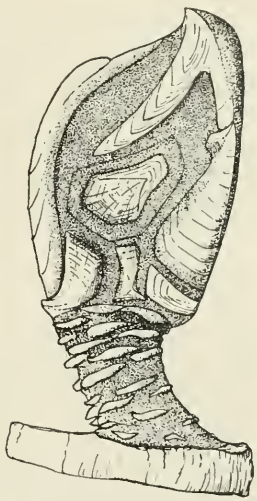


FIG. 30.—SCALPELLUM IMPERFECTUM. LATERAL VIEW OF TYPE × 1½.

The scutum is triangular, narrow above, over twice as long as wide, with a small wing or triangular projection on the lateral side of the apex. The occludent margin is slightly convex, longer than the straight lateral margin. The umbo is apical.

The tergum is V-shaped, the two branches of about equal width, and both are somewhat curved. That along the occludent margin is truncate at the end under the apex of the tergum. The other branch is much longer and tapers to an acute end. The apex is rather strongly recurved and acute, but a chitinous border projects beyond it along the occludent margin, and there is a very small wing on the carinal side of the apex.

The carina is widely separated from the other plates. It is abruptly bent at the umbo, which is situated between the upper third and fourth of the whole length of the plate. The roof is flat, bounded by angles or low ribs, and with nearly straight growth lines. The sides are moderately wide in the middle, tapering above and below. The base is almost squarely truncate.

The upper lateral plate is widely separated from the other plates, piriform, narrower above, the scutal and tergal margins straightened, baso-carinal margin irregularly rounded. The umbo is at the upper third of the length of the plate.

There is no rostrum.

The rostral latus is narrow, the scutal and basal margins parallel. Umbones at the upper front angle, and in contact.

The inframedian latus is narrow, somewhat the shape of a wine glass, a little expanded at the base and summit, narrower at the lower third. Umbo median at the lower third.

The carinal latus is of a curved triangular shape, the carinal margin concave, baso-lateral margin convex. The apex projects well beyond the carina, as in *S. scalpellum*, etc.

The peduncle is short, with about eight rows of five scales each.

Length of the capitulum 29 mm., breadth 20 mm. Length of the peduncle 14 mm. Length of carina 27 mm., diameter at base 5 mm.

The mandible (Plate IV, figs. 17, 18) has four teeth, counting the lower point. The first tooth is rather widely separated from the second. The lower point, shown more magnified in fig. 18, is obtuse, ending in a group of fine spines.

The first pair of cirri has unequal rami of 9 and 13 joints. The shorter, anterior, ramus is about twice as wide as the other. Both are densely hairy and spinose.

The sixth pair of cirri has rami with about 36 segments. An intermediate segment of the outer ramus is figured (Plate IV, fig. 15). There is a series of long spines along the anterior margin, four on a segment. These are paired with shorter spines on the inner face, shown in dotted lines. There are also several short spines at the sutures. The posterior edge is very minutely spiculose, and has three spines on a segment, the uppermost one large, the others quite small. There is also a row of short spines on the inner face, more or less distinctly visible through the segment, and shown on the figure in dotted lines. The spines diminish in size toward the bases of the rami, and in number toward the apices, as in all other forms.

The caudal appendage (Plate IV, fig. 16) consists of 6 joints, terminating in a group of 6 long spines. There are also smaller spines at the sutures.

This species differs from others of the partially calcified group by having only the terga V-shaped, and with the carina and lower whorl of plates resembling species of the *S. scalpellum* group. *S. compressum* Hoek, from the equatorial Pacific, 2,150 fathoms, has some resemblance to *imperfectum*, and the antipodal *S. intermedium* also resembles it except in the form of the carina and lower plates. *S. imperfectum* is very closely related to *S. sanctæbarbaræ* from the Californian coast, but the carina of the latter has a less projecting umbo, its roof is not so flat, and it is rounded at the base, and widely separated from the carinal latera. The carinal latera do not project below the carina; and, moreover, the plates of the lower whorl are more reduced in size in *S. sanctæbarbaræ*.

The largest example of the type lot has a capitulum 35 mm. long. Those from other stations are smaller. In No. 9007, an individual with the capitulum 20 mm. long, the carinal latera do not project behind the carina. Otherwise the plates are like those of the larger individuals. (Fig. 30.)

SCALPELLUM SANCTÆBARBARÆ, new species.

Type.—Cat. No. 32915, U.S.N.M.

Type-locality.—*Albatross* Station 2839, off the Santa Barbara Islands, California, in 414 fathoms.

Other locality.—*Albatross* Station 2980, off Southern California, 603 fathoms.

The capitulum is irregularly ovate, composed of 13 imperfectly calcified plates, covered with a very thin smooth cuticle. The ventral margin is strongly curved or subangular at the junction of scuta and terga. The summit is obtuse. The dorsal outline is very convex, subangular at its upper third. The calcified portions of the plates are nearly smooth.

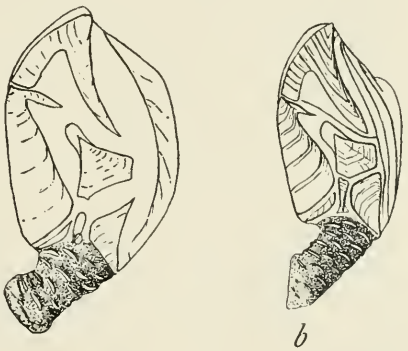


FIG. 31.—SCALPELLUM SANCTÆBARBARÆ *a*, TYPE; *b*, A YOUNG INDIVIDUAL × 1½.

The scutum is triangular, with a short narrow tergal branch at the apex. The occludent segment is about 2½ times as long as wide, convex, with nearly straight occludent and lateral margins, and an oblique, straight basal margin.

The tergum is V-shaped, both branches curved, the carinal branch somewhat the longer. The apex is very slightly recurved, a chitinous lobe on the occludent border is wider above, projecting, rounded, and obtuse above the calcified umbo of the plate.

The carina is strongly arcuate, very obtusely subangular at the umbo, which lies at the upper fourth of the plate, and projects but little. The roof is broad and flat, with bordering angles, distinct above, obtuse near the base. The sides are extremely narrow, widest under the umbo. The upper end of the carina is rounded and approaches close to the apices of the terga. The base is rounded.

The upper latus is broadly spatulate, the long scutal and tergal margins concave, basal and carinal margins equal and very short, with a straight margin between them. The umbo is near the base of an upper narrow tongue-shaped appendage of the plate.

There is a small wedge-shaped rostrum, either wholly chitinous or with a very small calcareous center; often it is hardly noticeable, and sometimes apparently wanting.

The rostral latus is extremely narrow and long. The inframedian latus is long and narrow, the carinal and rostral sides parallel, upper end truncate, and the lower end somewhat dilated, basal margin straight. The umbo is at the middle close to the basal margin.

The carinal latus is irregularly triangular, the carinal margin longest, straight. The basal margin is oblique, straight, curving into the concave or straight upper margin. The umbo is basal and those of both latera are contiguous below the carina, but not projecting.

The peduncle is short, with ten rows of about ten transversely lengthened scales, of which only the ridges are calcified.

Length of capitulum 20, breadth 14 mm.; length of peduncle 8 mm. Length of carina 19, diameter at base 5 mm.

A series of 10 individuals was taken at the type-locality. The calcified portions of the plates are comparatively larger in the young specimens with a capitulum 13 mm. long, but otherwise similar to the adult stage. In some examples a small triangular rostrum is distinctly developed, sometimes with a minute calcified center; but in others it can not be distinguished. The largest capitulum is 24 mm. long.

A single mutilated capitulum was taken at Station 2980.

In the figured adult the umbo of the carina is worn, as is usual in large specimens of the species. An immature individual of the type lot, with the capitulum narrower and the carina perfect, is also illustrated. It measures, length of capitulum 17, width 10 mm. The carina is less arched in young than in old examples.

This species is closely related to *S. imperfectum* of the east coast of the United States, but it differs by the narrower rostral latera, the less projecting umbones of carina and carinal latera, the less distinctly wineglass shaped inframedian lateral plate, the longer tergo-lateral lobe of the scutum, etc.

S. sanctæbarbaræ and *S. imperfectum* are related to *S. gruveli* Annandale, from the Indian Ocean, yet among other differences they are unlike *S. gruveli* in having the umbo of the carina much farther removed from the apex of the plate, the upper latus is more broadly triangular, and the scales of the peduncle are smaller. (Fig. 31.)

SCALPELLUM LARVALE Pilsbry.

1907. *S. larvale* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 194, pl. VI, figs. 2–6.

Type.—Cat. No. 32417, U.S.N.M.

Type-locality.—*Albatross* Station 4353, off Point Loma Light-House, California, 639 fathoms.

Subfamily OXYNASPIDINÆ.

Genus OXYNASPIS Darwin.

OXYNASPIS PATENS Aurivillius.

1894. *Oxynaspis patens* Aurivillius, Kongliga Svenska Vetenskaps-Akademiens Handlingar, XXVI, No. 7, p. 38, pl. III, figs. 1, 2. Near Anguilla Island.

Locality.—Cat. No. 11533, U.S.N.M. *Albatross* Station 2651, Bahamas, north latitude 24° 02′, west longitude 77° 12′ 45″, in 97 fathoms.

Subfamily LEPADINÆ.

Genus LEPAS Linnæus.

1758. *Lepas* Linnæus (part) Syst. Nat., 10th ed., p. 667.[a]
1851. Darwin, Monograph on the Cirripedia, Lepadidæ, p. 67.

Valves 5, approximate; carina extending up between the terga, terminating below in an embedded fork or external disk; scuta subtriangular, umbones at the rostral angle; caudal appendages uniarticulate (Darwin).

Type.—*Lepas anatifera* Linnæus.

Common in all seas on floating objects. The following key is slightly modified from Hoek.

KEY TO AMERICAN SPECIES.

a. Carina terminating below in a flat oblong external disk, umbo angularly projecting; valves thin, papery ..... *L. fascicularis.*
aa. Carina terminating below in a fork, umbo basal; valves well calcified.
b. Valves radially furrowed or strongly striate.
c. Occludent margin of the scutum arched, protuberant ..... *L. anserifera.*
cc. Occludent margin close to the ridge from the umbo to the apex .. *L. pectinata.*
bb. Valves smooth or very minutely striate radially.
c. Valves smooth or delicately striate; an internal umbonal tooth on the right-hand scutum ..... *L. anatifera.*
cc. Valves not striate radially; no internal umbonal teeth on the scuta .. *L. hillii.*

LEPAS ANATIFERA Linnæus.

Plate IX, figs. 3, 4, 5.

1758. *Lepas anatifera* Linnæus, Syst. Nat., 10th ed., p. 668.
1851. Darwin, Monograph on the Cirripedia, Lepadidæ, p. 73.

This is our most abundant goose-barnacle on driftwood, etc. It resembles *L. hillii*, but may be distinguished by the finely, faintly striated valves, the presence of an umbonal tooth in the right scutum, none in the left, and the proximity of the base of the carina to the

[a] The genus *Lepas* was proposed by Linnæus in 1758 to include both sessile and stalked barnacles. Da Costa, in 1778, excellently defined the genus *Balanus*, thereby removing the sessile forms from Linnæus's group, and leaving it for the goose-barnacles, for which the name *Lepas* has almost universally been reserved.

scutum. The carina is often dentate along the roof, and frequently the scutum has an oblique series of square gray spots; but these features are inconstant. Among many other lots, specimens are in the collection from the following:

Localities.—Atlantic: Vineyard Sound and Woods Hole, Massachusetts; Long Island Sound; off New Jersey, Station 2039; Key West; Gulf of Mexico, Station 2379; Cameron, Louisiana; St. Thomas; Swan Island, Caribbean Sea. Also many European localities.

Pacific: Bering Island; Sitka; Unalaska; Straits of Fuca, Oregon; San Diego, California; Panama; Japan.

LEPAS HILLII Leach.

Plate VIII, figs. 2, 7.

1851. *Lepas hillii* Leach, in Darwin, Monograph on the Cirripedia, p. 77.

This common goose-barnacle is very similar to *L. anatifera*, from which it is chiefly to be distinguished by the smoother valves, the absence of umbonal teeth within the scuta, and the presence of three filaments on each side of the body, while *L. anatifera* has only one or two. When fresh, the carina is separated from the other valves at the base by a purplish cuticle, and the summit of the peduncle is pale or orange colored.

Localities.—Atlantic: Grand Manan, New Brunswick; Le Have Bank. Pacific: Bering Island, abundant; Shumagin Island; Unalaska; San Francisco.

A variety *californiensis* Gruvel has been described from Lower California. It is not represented in the museum collection.

LEPAS ANSERIFERA Linnæus.

Plate VIII, figs. 1, 3.

1851. *Lepas anserifera* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 81.

This species is commonly found on driftwood and also on floating seaweeds, in the latter case frequently associated with *L. pectinata*. The plates are *grooved radially*, the tergum often more strongly than the scutum, but the grooves vary greatly in emphasis. It differs from *L. pectinata* chiefly in the scutum and carina. The occludent border of the scutum is strongly arched, forming a comparatively wide area between the border and the ridge running from the umbo to the apex of the plate, and the carina is not contracted just above the fork. In *L. pectinata* the ridge on the scutum runs very close to the less arcuate occludent border, leaving but a very narrow area, and the carina viewed dorsally is conspicuously contracted just above the basal fork.

Localities.—Atlantic: Shetland Islands and Oban, Scotland; Cork, Ireland; Fayal, Azores; south of Newfoundland, Hydrographic Sta-

tion 756; Georges Bank; off Marthas Vineyard; Asbury Park, New Jersey; Smiths Island and Cherrystone, Virginia; off Cape Hatteras; off east coast of United States, *Albatross* stations 2104, 2711, 2097, 2221, 2713, 2711, 2712, 2714, 2715, 2584, etc.; off Florida, *Albatross* Station 2647; Gulf of Mexico, *Albatross* Station 2379; Cameron, Louisiana; Jamaica, C. B. Adams; Caribbean Sea, *Albatross* Station 2127.

Pacific: Gulf of California, *Albatross* Station 2998; between California and Hawaiian Islands, Hydrographic Station 2665; Honolulu; off Japan, *Albatross* Station 3766; Philippine Islands, E. A. Mearns.

Indian Ocean: Longitude 90° east, on the equator, Capt. J. R. Lyon.

LEPAS PECTINATA Spengler.

Plate VIII, figs. 4, 5, 6, 8.

1851. *Lepas pectinata* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 85.

A common form on "gulf weed." The valves are radially striate or grooved or are often profusely spinose (fig. 4). It can be distinguished from *L. anserifera* by the very narrow area between the occludent border and the ridge from umbo to apex of the scutum. The tergum is notched to receive the apex of the scutum. The smoother forms of the species often have the capitulum conspicuously inflated (figs. 5, 6). *Lepas pectinata* is pelagic, and chiefly flourishes in warm seas.

Localities.—Atlantic: Oban, Scotland; South of Newfoundland, *Albatross* Hydrographic Station 756; Georges Bank; off east coast United States, *Albatross* stations 2314, 2097, 2109; Gulf of Mexico, *Albatross* Station 2379; off east coast of South America, *Albatross* Station 3766, south latitude 36° 47′.

Pacific: Bering Island, Bering Sea; off San Diego and Santa Catalina Island, California.

LEPAS FASCICULATUS Ellis and Solander.

Plate IX, fig. 6.

1851. *Lepas fasciculatus* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 92, pl. 1, fig. 6.—Verrill, Invert. Anim. Vineyard Sound, etc., p. 285, in Rep. Commissioner Fish and Fisheries for 1874, pp. 382, 579, pl. vii, fig. 34.—Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, 1907, p. 193.

A pelagic form, easily known by the thin, paper-like plates, and the angularly bent carina, with a prominent umbo and expanded basal disk. It should be separated subgenerically from the other Lepades.

Localities.—Atlantic: Off Nova Scotia; Grand Manan, New Brunswick; off Marthas Vineyard and Nantucket; off North Carolina, etc.; *Albatross* stations 2021, 2532, etc.

Pacific: Between San Francisco and Unalaska, *Albatross*, July 18, 1891; latitude 29° 52′ north, longitude 116° 15′ west, R. E. C. Stearns; off Japan, *Albatross* Station 3766, surface.

Genus PŒCILASMA Darwin.

1851. *Pœcilasma* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 99, first species *P. kæmpferi.*

1884. *Temnaspis* Fischer, Bull. Soc. Zool. de France, IX, 1884, p. 357, for *P. fissa* Darwin.

Capitulum of five fully calcified approximate valves, the umbones of scuta and carina basal; carina not extending between the terga, narrow throughout. No lateral filaments at bases of the cirri; caudal appendages one-jointed, spinose. Cirri ii to vi with 4 or 5 pairs of long spines on the anterior side of each segment.

Type.—P. kæmpferi.

The discovery of new forms has materially enlarged the group of pentaspidian barnacles of the *Pœcilasma* type since Darwin's time, and some notes on their classification and nomenclature may be in order. The oldest generic name for a species of the series is *Trilasmis* Hinds, based on *T. eburneum* Hinds. If we consider this species to be a *Pœcilasma*, then the name *Trilasmis* must replace *Pœcilasma*, since it is anterior in date. In a former paper I admitted both groups as genera, thinking the peculiar structure of the carina of *Trilasmis* justified this course.[a] It must be conceded that *T. eburneum* does not differ from *Pœcilasma* much more than *Lepas fascicularis* from the other species of *Lepas;* yet I think no advance in our conceptions would result from merging *Pœcilasma* in *Trilasmis*, but rather the reverse.

Pœcilasma, after the elimination of *Trilasmis*, still contains very diverse species, and those like *P. carinatum*, *P. rectum*, etc., with the carina enlarged basally, should probably be separated from *Pœcilasma* and united to *Megalasma* as a subgenus. For the present I erect a subgenus *Glyptelasma* for them. This group stands between *Pœcilasma* and *Megalasma*, and doubtless was ancestral to the latter genus, which differs from *Glyptelasma* only by the rotation of the basal margin of the scutum through 90°, bringing it in line with the occludent margin. The apparent change in the position of the umbo is due to this rotation. Morphologically its position is the same in *Megalasma*, *Pœcilasma*, and *Lepas*.

The characters of the groups under discussion are exhibited in the following analytical key.

KEY TO GENERA AND SUBGENERA.

a. Carina expanded around and below the umbo in a flat, rounded disk, the upper end acute; no terga; upper margin of scutum rounded ..... *Trilasmis.*

aa. Carina with basal, terminal umbo, the upper end obtuse; terga present.

b. Carina narrow throughout, not expanding laterally at the base; surface of the valves smoothish.

[a] Bulletin of the Bureau of Fisheries, XXVI, 1907, p. 183.

c. Scutum not slit; cirri normal ..... *Pœcilasma.*

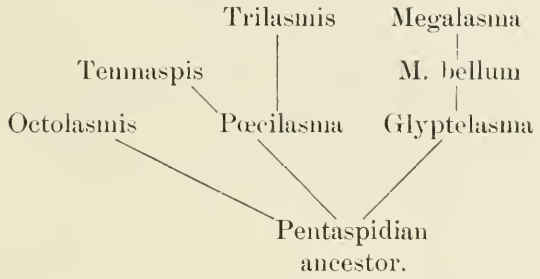
cc. Scutum usually divided by an arcuate slit; cirri peculiar..... *Temnaspis.*

bb. Carina with wide sides, expanding laterally in the lower part or at the base; scutum biangular above, with a distinct ridge to tergo-carinal angle; surface roughened.

c. Basal or peduncular margin of scutum making a right angle with the occludent margin, the umbo at the angle..... *Glyptelasma.*

cc. Basal or peduncular margin of scutum a continuation of the occludent margin, the umbo therefore above the basal angle of the plate... *Megalasma.*

The relations of the groups are expressed in the following diagram:



I have examined the mouth parts and cirri in *Pœcilasma kæmpferi*, *P. k. litum*, *P. inæquilaterale*, *Megalasma annandalei*, and *M. gracilius*. There is an unusual uniformity throughout these forms. The armature of the cirri reminds one of *Scalpellum*.

KEY TO AMERICAN SPECIES OF PŒCILASMA AND MEGALASMA.

a. Carina wide in its lower part, expanding laterally near the base.

b. Basal margin of the scutum about at a right angle with the occludent margin. East American.

c. Umbo of carina projecting beak-like below the base of the scutum, and at an angle with it.

d. Basal margin of carina as long as the base of the scutum, its sides wide in the lower half ..... *M. g. gracilius.*

dd. Basal margin of carina shorter than base of scutum, its sides wide in the lower third..... *M. annandalei.*

cc. Umbo of carina not produced below base of scutum.

d. Occludent margin nearly straight; carina with the basal margin straight, the sides narrow, abruptly auriculate at base..... *M. rectum.*

dd. Occludent margin well arched; carina with very wide sides, the basal margin as long as that of the scutum ..... *M. subcarinatum.*

bb. Basal margins of the scutum and carina nearly parallel to the occludent margin; sides of carina very wide. Hawaiian..... *M. bellum.*

aa. Carina narrow throughout, not expanding laterally at the base.

b. Carinal end of the tergum very short ..... *P. inæquilaterale.*

bb. Carinal end of the tergum longer, about half as long as the occludent margin.

c. A distinct ridge or angle extending from umbo to tergo-carinal angle of scutum; basal margin of scutum less than half the length of the tergum..... *P. kæmpferi norwangliæ.*

cc. No distinct ridge to the tergo-carinal angle of scutum.

d. A narrow area between the ridge from umbo to apical angle of scutum, and the occludent border.....*P. kæmpferi.*

dd. A rather wide area between the ridge and the occludent margin.

P. kæmpferi litum.

Subgenus PŒCILASMA s. str.

Smoothish forms with narrow carina and surface sculpture of fine engraved striæ, the scutum not slit; living chiefly on the carapaces of crabs. The species are closely related and variable, and their determination is difficult. The capitulum is often bilaterally asymmetrical. All known American forms are figured on Plate VI.

PŒCILASMA KÆMPFERI Darwin.

Plate V, figs. 10, 11; Plate VI, figs. 3, 4, 5.

1851. *Pœcilasma kæmpferi* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 102, pl. II, fig. 1 (Japan, on *Inachus kæmpferi*).—Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, 1907, p. 183 (Hawaiian Islands).

Locality.—Cat. No. 28653, U.S.N.M. Japan, on *Kæmpferia kæmpferi.*

The largest of three capitula measures, length 14, width 8.5, diameter 4.3 mm. Carina 9 mm. long. Peduncle 6.5 mm. long. The left scutum is somewhat more convex than the right. The scuta have distinct radial striæ and some concentric grooves.

Internally the scuta have strong umbonal teeth and a rather narrow, smooth, and rounded basal callous rib (Plate VI, fig. 3). The carina (figs. 4, 5) is concave inside, the concavity decreasing toward the base. The teeth at its baso-scutal angle are very small, and in the example examined, asymmetrical.

The mandible of No. 28653 has four teeth and a small lower point, the upper two teeth widely spaced. There is a small beard on the lower margin, scarcely any on the upper (Plate V, fig. 11).

The maxilla (Plate V, fig. 10) has two large upper spines, the edge deeply notched below them, sparsely spiny in the notch. It then protrudes and is rather closely set with spines.

Cirri are about as figured for *Megalasma annandalei.*

M. Gruvel, in his report on the *Travailleur* and *Talisman* Cirripedes, has considered *P. aurantia* Darwin a variety of *P. kæmpferi*, stating that of seven examples taken off Cape Bojador in 410 to 782 meters, part had characters of the one, part of the other form.[a] No western Atlantic examples I have seen agree entirely with the Japanese or eastern Atlantic forms, as defined by Darwin and Gruvel; and while their differential characters are not of great importance, yet it seems desirable that they be put on record.

[a] See Zool. Trav. et Talism., Cirrhipèdes, p. 46, pl. IV, fig. 1.

PŒCILASMA KÆMPFERI LITUM, new subspecies.

Plate VI, figs. 1, 2.

Type.—Cat. No. 32902, U.S.N.M.

Type-locality.—U. S. Fish Commission steamer *Fish Hawk* Station 7512, Gulf Stream off Fowey Rocks Light, Cape Florida, 170 fathoms.

The capitulum is equilateral, somewhat less swollen than the Japanese *P. kæmpferi* examined. Scutum and tergum have distinct radial striæ and very fine, close growth-lines. The ridge from umbo to apex of the scutum is well defined, but that to the tergo-carinal angle is barely indicated. The base of the scutum is about three-fifths the length of the tergum. The occludent margin is very convex in its upper half, the area in front of the ridge running to the apex being wider than in *P. kæmpferi*. Internally each scutum has an umbonal tooth and a narrow but rather high and sharp straight basal ridge. The tergum is shorter than in *P. kæmpferi*, barely half as long as the scutum.

Length of capitulum 12, width 6.8, diameter 3.3 mm. Length of carina 7.8, of peduncle 5 mm.

The mouth parts and cirri closely resemble those of Japanese *P. kæmpferi*.

PŒCILASMA KÆMPFERI NOVÆANGLIÆ, new subspecies.

Plate VI, figs. 13, 14.

Type.—Cat. No. 9032, U.S.N.M.

Type-locality.—U. S. Fish Commission Station 1120, off Marthas Vineyard, 194 fathoms, on carapax of *Eupagurus politus*.

Larger than *P. kæmpferi;* the capitulum equilateral. The scutum has a strong ridge running from the umbo to the apex, and another to the tergo-carinal angle. The basal margin is very short, less than half the length of the tergum. It is sculptured with distinct radial striæ and growth-wrinkles.

Length of the capitulum 17, breadth 9.7, diameter 5.75 mm. Length of the carina 12, of the peduncle 9 mm.

In *P. kæmpferi* and *aurantia* there is no distinct ridge from the umbo to the tergo-carinal angle of the scutum, and the base is longer.

A very small example, No. 9019, from *Albatross* Station 2115, is probably referable to the above subspecies. It occurred on *Lithodes agassizii*.

PŒCILASMA INÆQUILATERALE, new species.

Plate VI, figs. 6, 7, 8, 11, 12.

Type.—Cat. No. 12899, U.S.N.M.

Type-locality.—*Albatross* Station 2744, 38° 35′ north latitude, 73° 05′ 15″ west longitude, 554 fathoms.

Other localities.—Off the eastern coast of the United States between 39° 53′ and 37° 34′ 30″ north latitude at *Albatross* stations 2030, 2171, 2179, 2180, 2181, 2201, 2202, 2215, 2216, 2234, 2235, 2546, 2552, 2680, 2691, 2739, 2742, 2744, 2749, in 444 to 963 fathoms, chiefly on carapax of *Geryon quinquedens*. Fish Commission Station 1140, off Marthas Vineyard, 374 fathoms, on *Geryon*. *Albatross* Station 2237, Hampton Roads, 12 fathoms on *Geryon*. Off Key West, Florida, 70–80 fathoms, on *Scyramathia crassa*, State University of Iowa Expedition, 1893.

The capitulum is inequilateral, oblong, the occludent border only weakly convex, the carinal strongly so. The plates are white or faintly pink-tinted, glossy, with minute sculpture of fine radial striæ and low rather coarse concentric wrinkles; the narrow area between the occludent margin and the apico-umbonal keel has very fine oblique striæ.

The scutum has a moderately arcuate occludent border, the greatest curvature being near the apex and base. The umbo is somewhat produced and incurved. The basal margin is short and oblique. Only a very weak trace exists of a curved ridge from umbo to the junction of tergum and carina, and there is no distinct angle in the outline of the plate at the tergo-carinal suture. A distinct ridge or angle runs from the umbo to the apex, nearly straight in its apical half, and defining a narrow occludent area. Internally there is a strong but narrow rounded basal rib and a stout but low umbonal tooth. The two scuta are more or less unequal in convexity.

The tergum is small and wedge-shaped, but wider than the carina, the carinal end being truncate or rounded. It has radiating and growth striæ.

The carina is regularly arcuate, very narrow and slender, with narrow rounded roof. The roof is slightly wider above than near the umbo, but the sides are somewhat wider below. Internally the surface is concave near the umbonal end, elsewhere convex. There are no distinct teeth, and no post-umbonal expansion or disk.

The peduncle is short, one-half to one-fourth the length of the capitulum, with prominent annuli as in related species.

Length of the capitulum 11.5, width 7, diameter 3.2 mm.

The mouth parts and cirri closely resemble those of *P. kæmpferi*, but the edges of the teeth of the mandible are slightly serrate.

This species ranges along the east coast of the United States from Marthas Vineyard to Key West, usually living on the crab *Geryon quinquedens*, often in great profusion, in depths of 500 to 800 fathoms, though one lot was taken in but 12 fathoms. It is very variable in the degree of asymmetry, some individuals being nearly symmetrical bilaterally. Either the right or the left scutum may be the more

convex. The size of adult examples is also subject to considerable variation.

P. inæquilaterale is closely related to *P. kæmpferi*, but it differs by the decidedly smaller tergum, less arcuate occludent border and frequently more asymmetrical valves, though some individuals are nearly equivalve. *P. crassum* is a shorter, wider form, with the occludent border more strongly arched, and having a well-developed embedded appendage at the umbonal end of the carina, wanting in *P. inæquilaterale*.

There is great variation in the degree of asymmetry among the specimens from most stations. Either the right or the left valve may be the more convex. Figs. 6, 7, 11, and 12 represents individuals of the type lot, figs. 6 and 7 being the type. The interior, fig. 8, is drawn from specimens taken off Key West, Florida, in 70 to 80 fathoms, on *Scyramathia crassa* A. Milne-Edwards.

PŒCILASMA INÆQUILATERALE BREVE, new subspecies.

Plate VI, figs. 9, 10.

Type.—Cat. No. 32919, U.S.N.M.

Type-locality.—*Albatross* Station 2352, Gulf of Mexico, north latitude 22° 35′, west longitude 84° 23′, in 463 fathoms, on *Bathyplax typhla* A. Milne-Edwards.

Similar to *P. inæquilaterale*, but the capitulum is very short and broad, and the tergum is much reduced. It differs from *P. crassum* by the straight occludent border of the scutum.

Length of the capitulum 7.5, breadth 5.3, diameter 3 mm.

Only two specimens were taken.

Genus MEGALASMA Hoek.

1883. *Megalasma* Hoek, Challenger Report, Zoology, VIII, p. 50. Type, *M. striatum*.

This genus differs from *Pœcilasma* in the shape of the carina, which is enlarged at the sides toward the base, with a concave plate inside, terminating upward in two stout teeth. The peduncle is very short. So far as I know, they do not live on crabs. The relationships of the group are discussed under *Pœcilasma*.

Subgenus GLYPTELASMA Pilsbry, new subgenus.

The type of this group is *M. subcarinatum*. These barnacles live chiefly on sea-urchin spines, on the larger forms of *Scalpellum*, etc., not, so far as I know, on crabs. The peduncle is quite short, not so long as in typical *Pœcilasma*.

MEGALASMA GRACILE GRACILIUS, new subspecies.

Plate V, fig. 16. Plate VII, figs. 6, 7, 8, 9.

Type.—Cat. No. 11346, U.S.N.M.

Type-locality.—From *Albatross* Station 2625, between Cape Hatteras and Charleston, South Carolina, on spines of *Dorocidaris papillata*, No. 12938, 247 fathoms.

Other localities.—Cat. No. 32900, U.S.N.M., *Albatross* Station 2658, between the Bahamas and Cape Fear, North Carolina, on *Scalpellum giganteum* Gruvel, in 514 fathoms.

The capitulum is twice as long as wide, widest in the middle, strongly inflated just below the middle, compressed above the inflation. The carinal border is much more convex than the occludent. The plates are sculptured with fine and very inconspicuous radial striæ and rather coarse wrinkles and occasional grooves along the lines of growth. The basal foramen is subcircular and small.

The scutum has a moderately curved occludent margin and very short basal margin. The straight tergal margin is slightly shorter than the carinal, which is convex, except near the base, where it is somewhat concave. A sharp keel runs from the umbo to the apical angle, and a strong angle to the tergo-carinal angle. The area in front of the keel is very narrow, with its fellow forming a narrowly lanceolate figure in ventral view. Internally there is a very small umbonal tooth in each valve and a small polished basal area of attachment of the peduncle, but no basal callus. (Fig. 7.)

The tergum is rhombic, its carinal margin about one-third as long as the occludent. Its surface is divided into two unequal areas by a diagonal line from the apex to the baso-carinal angle, the larger area being grooved lengthwise of the plate, the narrow upper area marked with lines at right angles to the other.

The carina (figs. 8, 9) is moderately and evenly curved, with a flat roof. The umbo projects beak-like far beyond the base of the scutum. The basal margin of the carina is fully as long as that of the scutum and forms a right angle with it. The sides of the carina are very wide in the basal third and are obliquely grooved. Inside the carina is slightly concave throughout, and a narrow cavity penetrates downward to the apex, behind a concave plate which extends over the basal region of the cavity. This plate becomes narrower above, is truncated, and its sides project to form two blunt teeth.

The peduncle is extremely short, about one-tenth the length of the capitulum, and scarcely extending beyond the umbo of the carina. It is transversely wrinkled and blackish.

Length of the capitulum (measured to the umbo of the carina) 11.8 mm., width 5 mm., diameter 3 mm. Length of the carina 7.75 mm.

The largest specimen measures, length 12.7, width 5.5, diameter 3.3 mm.

The mandibles and cirri resemble those of *P. kæmpferi*, but the maxilla (Plate V, fig. 16) has weaker spines at the upper angle, and its edge is much less deeply notched below them.

This form stands very near *M. gracile* Hoek, which is possibly from a mid-Atlantic station; but in *M. gracile* the lower area of the scutum is smaller, the tergum longer, and the carina more curved than in *M. g. gracilius*. The peduncle, too, is longer, one-third the length of the capitulum in Hoek's species, while in the series of seven *M. g. gracilius* it is extremely short.

Pœcilasma gracile Hoek was described from the *Challenger* station "164A, off Sydney, New South Wales, in 410 fathoms." Station 164B has been given for the locality of a series of mollusks in part of distinctly Atlantic relations.[a]

That they really came from the Australian station was doubted by the present writer.[b] Finally Mr. Charles Hedley[c] advanced the theory that 164B might be an error for 64, a station in the mid-Atlantic between Bermuda and the Azores, where, in 2,700 fathoms, "about a cwt. of ooze" was secured. The Australian Stations 164 and 164A were merely sounding stations,[d] the former in 950, the latter in 1,200 fathoms. No specimens other than "green mud" were reported as taken in the account of these soundings. From the alleged depth, 410 fathoms, it is obvious that the adjacent station, 164B, is the one intended by Hoek. The facts in the case, so far as known, favor Mr. Hedley's supposition that there was an error in reading the label and a mixture of material from two stations. It is possible, therefore, that *Pœcilasma gracile* is an Atlantic and not an Australian species.

MEGALASMA ANNANDALEI, new species.

Plate V, fig. 14. Plate VII, figs. 15–19.

Type.—Cat. No. 32901, U.S.N.M.

Type-locality.—*Albatross* Station 2731, off Cape Hatteras, on *Scalpellum velutinum*, in 781 fathoms.

The capitulum is twice as long as wide, compressed in its upper half, the lower half very plump. The occludent margin is moderately convex, the carinal margin strongly so. The plates are strong, white, and sculptured with very fine and faint radial striæ and rather widely spaced strong concentric grooves, with very fine intervening growth-striæ on the scuta, more crowded grooves on the terga. The peduncular orifice is nearly circular.

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[a] See E. A. Smith, Proc. Malac. Soc. London, I, pp. 59, 60.

[b] Manual of Conchology, XVII, p. 122.

[c] Proc. Linn. Soc. N. S. Wales, 1901, p. 22; *cf.* also Rec. Australian Museum VI, p. 212.

[d] Challenger Reports, Summary of Results, Pt. 1, p. 576.

The occludent margin of the scutum is convex; the straight tergal margin is shorter than the carinal margin, which is straightened or a little concave near the base, then strongly convex. The basal margin is very short. An angle runs from the umbo to the apex, defining a very narrow lanceolate ventral area. A curved ridge or angle runs to the tergo-carinal angle. An oblique constriction or wide furrow defines an obliquely sulcate basal area. Internally the scutum has a small umbonal tooth and a wide, low, and smooth basal callus.

The tergum is rhombic, the occludent margin parallel with the carinal, the latter more than half the length of the former.

The carina (figs. 18, 19) is moderately curved, with convex roof. The sides are narrow in the upper two-thirds, suddenly expanding in the lower third, and marked with narrow oblique riblets. The umbo is incurved and projects below the base of the scutum; the basal margin is as long as that of the scutum and forms an obtuse angle with it. Internally the carina is concave throughout. The cavity of the base is inclosed by a concave plate with notched upper margin, the sides being produced above in two short teeth.

The peduncle is cylindric, oblique to the capitulum, blackish, transversely wrinkled, and about one-fourth the length of the capitulum.

Length 19, width 9, diameter 5.5 mm. Length of the carina, 13 mm.

The teeth of the mandible are somewhat more slender and acute than in *P. kæmpferi*, and the upper and lower margins are bearded for a greater distance. The spines at the upper angle of the maxilla are more slender than in *P. kæmpferi*.

I have figured an intermediate segment from the sixth cirrus (Plate V, fig. 14). There are four pairs of large and one pair of small spines at intervals along the anterior side, and groups of 3 or 4 small spines at each articulation on the posterior side.

This species is related to *P. carinatum* Hoek, but differs by the strong concentric sculpture of the plates, the different form of the carina, especially interiorly, and the diverse sculpture of the interior of the scutum at its base.

MEGALASMA RECTUM, new species.

Plate VII, figs. 10–14.

Type.—Cat. No. 32895, U.S.N.M.

Type-locality.—*Albatross* Station 2042, east of New Jersey, near the following Station, in 1,555 fathoms.

Other localities.—No. 9016, U.S.N.M. *Albatross* station 2041, north latitude 39° 22′ 50″, west longitude 68° 25′, in 1,608 fathoms, globigerina ooze.

The capitulum is twice as long as wide, rather plump in the lower half, compressed above, the sides equally convex. The occludent margin is nearly straight, the carinal strongly convex. The valves

have a minute sculpture of fine, short, diverging impressions, giving the general effect of radial striæ, and coarse, widely spaced concentric ridges. The peduncular foramen is large and cordate in shape.

The scutum has a nearly straight occludent margin; carinal margin well arched. The basal margin is straight and forms an acute angle with the occludent. The basal edge flares broadly outward, there being a deep furrow or concavity above it. A distinct ridge runs almost straight from the umbo to the carino-tergal angle, dividing the plate into two areas, the upper one slightly the greater. Internally the scutum has no basal rib and no umbonal tooth. There is a dull or lusterless band along the internal basal margin where the peduncle is attached, contrasting with the glossy surface elsewhere. This band is of about equal width throughout and has no special sculpture. (Plate VII, fig. 12.)

The tergum is trapezoidal, with parallel occludent and carinal borders, the former double the length of the latter. A furrow runs from the umbo to the carino-scutal angle.

The carina (figs. 13, 14) is strongly arched; its roof is flat, with a median depression. The sides are well developed toward the base, closely striated longitudinally. On each side of the apical umbo the sides are auriculate, being produced laterally and twisted, the basal margin having somewhat the shape of a brace, thus: ⌒. The carina does not project basally as far as the scutum, and its base forms only the dorsal border of the peduncular foramen, not clasping the peduncle. When removed, the carina is seen to be concave internally. From the basal margin a very short, transverse, strongly bicuspid plate springs. This plate lies nearly parallel to the upper portion of the carina, but makes a right angle with the umbonal portion.

The peduncle is very short.

Length of the capitulum 15.5, breadth 7.5 mm., greatest diameter 4 mm; length of the carina 10 mm; length of the peduncle about 2 mm.

This species is related to *M. carinatum* Hoek, from near Culebra and Ascension islands, but differs by its straight occludent margin; the carina is longer, less expanded, and differently shaped basally, and the basal margin of the scutum is longer and flares strongly. The detached carina is shown in figs. 13, 14.

Three examples were taken at two adjacent stations.

MEGALASMA SUBCARINATUM, new species.

Plate VII, figs. 1–5.

Type.—Cat. No. 9059, U.S.N.M.

Type-locality.—*Albatross* Station 2042, east of New Jersey, 1,555 fathoms, on spines of a sea urchin.

Other localities.—No. 32899, U.S.N.M. *Albatross* Station 2041, north latitude 39° 22′ 50″, west longitude 68° 25′, near the preceding station, in 1,608 fathoms, globigerina ooze.

The capitulum is pointed-oblong, ventricose in the lower half, the occludent and carinal borders about equally convex, the total length about twice the greatest width. The plates are sculptured with fine, close, radiating impressions and distinct concentric wrinkles and spaced grooves. These are much closer on the terga and carina than on the scuta. The basal orifice is rounded-pentagonal, a little longer than wide.

The very large scutum has an evenly arched occludent border. The tergal margin is straight, the carinal convex, except near the base, where it is somewhat concave or hollowed out, to receive the enlarged side of the carina. The basal margin is short and straight. There is a depression running obliquely from the umbo to the concavity of the carinal margin. A subacute ridge runs from the umbo to the apical angle, defining a very narrow lanceolate area along the occludent margin. Another much less acute ridge runs to the tergo-carinal angle. The interior shows a small but prominent umbonal tooth in each (right and left) valve, and a small smooth basal area, which under a strong lens has very faintly traced radial and growth striæ. (Plate VII, fig. 3.) A small cavity extends from above under the umbonal tooth.

The tergum is trapezoidal, the carinal edge parallel to the occludent, and nearly half as long.

The carina is short, only slightly arcuate. Its roof is rather wide and flattened above. The sides are narrow above, but wider below the middle, and in the lower third it expands into a wide plate. The basal margin is straight, whether viewed from the side or back. In basal view the sides are seen to form a right angle. When detached the inner face of the carina is seen to be deeply concave throughout. A prominent septum or sheath, bilobed and projecting above, occupies slightly more than the lower fourth of the length. The cavity of the plate penetrates behind this septum to the apex.

The peduncle is very short, so short that the capitulum appears to be sessile.

Length of the capitulum 19, width 10, greatest diameter 5 mm.; length of the carina 12 mm.

Two other individuals of the type lot measure: Length of capitulum 16.5, width 8, diameter 4 mm.; length of carina 10 mm. Length of capitulum 16.2, width 8, diameter 3.8 mm.; length of carina 9.7 mm.

A very large detached scutum from the type locality measures 23 mm. long, indicating a larger size than any other known *Pæcilasma*.

The single specimen from Station 2041 measures: Length of capitulum 16.9, width 8.9, diameter 5 mm.; length of carina 10.4 mm.; length of the base of the capitulum 4.9 mm.

This species was taken at two adjacent stations in the Atlantic with *M. rectum*. It is closely related to *M. carinatum* Hoek, from off Culebra, off Ascension Island, and from Cuba, in from 390 to 500 fathoms, which has been described by Hoek[a] and by Gruvel,[b] yet the differences between the forms seem too numerous to permit us to unite them specifically.

M. carinatum has a proportionately narrower capitulum than *M. subcarinatum*, three times as long as wide. It is more contracted below; the basal outline is shorter. The valves seem to be smoother. According to Hoek, *M. carinatum* is "almost entirely smooth; when seen with a lens there appear fine striæ radiating from the umbones," whereas *M. subcarinatum* is rather coarsely wrinkled, as well as finely striate. There is not in *M. carinatum* such a distinct ridge from the umbo to the tergo-carinal angle of the scutum. The carina is more curved, and its upper portion more slender in *M. carinatum*, and it is less hollowed out internally. The basal internal areas of scutum and carina are also diverse in the two species. Since a number of individuals of both forms from several stations have been examined, it would appear that we have to do with two species closely related, yet, so far as present materials show, distinct.

Subgenus MEGALASMA Hoek.

MEGALASMA BELLUM (Pilsbry).

1907. *Pœcilasma bellum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 183, pl. IV, fig. 6.

Localities.—*Albatross* stations 4081 to 4084, off the north and northeast coast of Maui, in 202 to 267 fathoms; Station 4088, between Maui and Molokai, and Station 3893, Kaiwi channel, between Molokai and Oahu, in 220 fathoms. Bottom temperature from 46.7° to 51.7° F. These localities are additional to those given in the original account of this species.

Genus OCTOLASMIS Gray.

1825. *Octolasmis* Gray, Annals of Philosophy, X, p. 100, for *O. warwickii*.
1825. *Heptalasmis* Leach, MSS. in Gray, Annals of Philosophy, X, p. 100, based upon the same species.
1851. *Dichelaspis* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 115, first species mentioned *D. orthogonia*.
1869. *Paradolepas* Macdonald, Proc. Zool. Soc., p. 442, for *P. neptuni*.
1894. *Trichelaspis* Stebbing, Annals and Magazine of Nat. Hist., 6th ser., XIII, p. 443, for *T. forresti*.

Small *Lepadidæ* with five incompletely calcified valves, or sometimes apparently with three when the terga are not calcified. The

[a] Challenger Reports, Zoology, VIII, Cirripedia, p. 44, pl. I, figs. 8–10; pl. II, fig. 1; pl. VII, fig. 6. 1883.

[b] Transactions, Linnean Society of London, VIII, 1901, p. 157, pl. XVII, figs. 9–16.

umbones of the plates are situated as in *Pœcilasma*. The typical forms (*Octolasmis s. str.*, including *Paradolepas* and *Trichelaspis*) are fragile creatures mainly living as commensals on the gills of crabs or macrura, or on the walls of the gill cavity. They have the calcified portions of the valves much reduced, and the base of the slender carina is forked.

Another series of species, such as *O. orthogonia*, *sessile*, *americanum*, and *hawaiense* have more strongly calcified valves, the tergum more normally shaped, and the carina expanded into a disk at the base. These may retain the subgeneric name *Dichelaspis*, type *orthogonia*. They live externally on crabs, etc.

KEY TO NORTH AMERICAN SPECIES OF OCTOLASMIS.

a. Carina slender, distinctly forked at the base; tergum small, irregular. Living in the gill cavities of decapod crustaceans.

b. Scutum composed of a narrow occludent and a wide triangular lateral segment, separated by a rather narrow slit. Antilles, on *Palinurus* gills. *O. hoeki* Stebbing. *O. antiguæ* Stebbing.

bb. Upper margin of lateral segment of scutum at a right angle with the occludent segment.

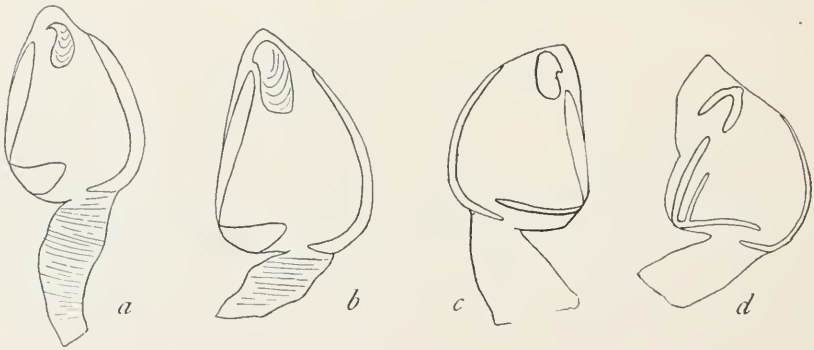

FIG. 32.—*a*, *b*, OCTOLASMIS GERYONOPHILA. *c*, O. MÜLLERI. *d*, O. FORRESTI. × 8.

c. Lateral branch of scutum rather wide, somewhat triangular and short, not more than half the length of the occludent branch; on crabs..... *O. geryonophila.*

cc. Lateral branch of scutum very narrow and nearly as long as the occludent branch.

d. Scutum composed of two branches; on crabs ..... *O. mülleri.*

dd. Scutum composed of three slender branches; on *Palinurus*..... *O. forresti.*

aa. Carina stronger, expanded in a sort of collar at the base, partially clasping the peduncle; tergum triangular; living externally.

b. Scutum L-shaped, with a short lateral segment ..... *O. americanum.*

OCTOLASMIS GERYONOPHILA, new species.

Type.—Cat. No. 9038, U.S.N.M.

Type-localities.—*Albatross* stations 2215 and 2216.[a]

[a] The specimens from these two stations were not kept separate in the collection.

Distribution.—Beyond the 400-fathom line, from south of Nantucket to off the Delaware Capes, in the branchial cavity of *Geryon quinquedens*, at the following stations:

Cat. No.	Station.	North latitude.	West longitude.	Depth.
		° ′	° ′	*Fathoms.*
9031	937	37 49	69 49	616
10776	2549	39 51	70 17	571
9038	2215	39 48	70 31	578
9038	2216	39 47	70 30	963
11755	2691	39 37	71 08	835
9023	2206	39 35	71 24	1,043
9033	2201	39 39	71 35	538
9021	2030	39 29	71 43	588
9022	2179–80	39 30	71 50	510–523
9008	2181	39 29	71 46	693
9029	1049	38 28	73 22	435

The capitulum is quite compressed, somewhat triangular, widest near the base, its width about two-thirds the length. The occludent margin is nearly straight, the carinal convex.

The scutum is calcified in two segments at right angles. The occludent segment is lanceolate; the basal segment is much broader, subtriangular, nearly two-thirds the length of the occludent segment, its upper margin straight.

The tergum is quite small, somewhat claw-shaped, the basal margin rounded, the upper portion tapering, hooked towards the occludent margin, with the end acute.

The carina is moderately curved above, strongly so near the base. It is fully three-fourths the length of the capitulum. The roof is rounded and with the sides is rather wide throughout. The base is forked, the branches straight, extending about to the middle of the peduncle.

The peduncle is nearly as long as the capitulum, cylindric, and very finely, faintly wrinkled transversely.

Length of the capitulum 3.5, breadth 2.5 mm. Length of the peduncle 2.5 to 3 mm.

O. geryonophila is related to *O. mülleri* (Coker), but differs conspicuously and constantly in the shape of the lateral segment of the scutum, which is invariably short and wide in *O. geryonophila*, long and slender in *O. mülleri*. It is an abundant species, only known from the gill cavity of the crab *Geryon quinquedens*, and taken only in a rather small area off the continental slope east of New Jersey, in 435 to 1,043 fathoms. (Fig. 32*a*, *b*.)

OCTOLASMIS MÜLLERI (Coker).

1902. *Dichelaspis mülleri* Coker, U. S. Fish Commission Bulletin for 1901, pp. 401–412 (Beaufort, North Carolina, on *Callinectes sapidus*).

Locality.—Cat. No. 43100, U.S.N.M., Cameron, Louisiana, on gills of *Callinectes sapidus* (Ord). R. P. Cowles.

This species has been well described and figured by Mr. Coker from specimens taken at Beaufort, North Carolina. I have found it on the gills of an undetermined crab taken in Lake Worth Inlet, Florida. One of these is drawn in fig. 32 *c*. It is apparently restricted to shallow water crabs, as *O. geryonophila* is to those of deep water.

OCTOLASMIS FORRESTI (Stebbing).

1904. *Trichelaspis forresti* Stebbing, Annals and Mag. of Nat. Hist., 6th ser., XIII, p. 444, pl. xv, May, 1894.
1905. *Dichelaspis forresti* Stebbing, Gruvel, Monographie des Cirrhipèdes, p. 132.

Locality.—Summerland Key, Florida, in the gill cavity of *Palinurus argus*, H. A. Pilsbry, March, 1907. (See fig. 32*d*.)

No more definite locality than "West Indies" has hitherto been given for this species. Its host lives in quite shallow water, 2 or 3 feet. (Fig. 32*d*.)

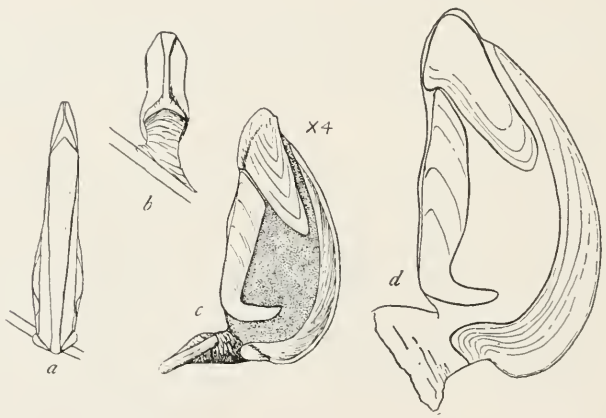

Fig. 33.—Octolasmis americanum. *a*, *b*, *c*, Carinal, basal, and lateral views of the type; *d*, lateral view of an old individual. × 4.

Subgenus DICHELASPIS Darwin.

OCTOLASMIS AMERICANUM, new species.

Type.—Cat. No. 32892, U.S.N.M.

Type-locality.—*Albatross* Station 2041, between Cape May and Nantucket Island, north latitude 39° 23′, west longitude 68° 25′, in 1,608 fathoms, globigerina ooze, with No. 9057.

Other localities.—No. 11860, *Albatross* Station 2709, between Cape Breton and Nantucket, north latitude 40° 07′, west longitude 67° 54′, in 866 fathoms.

The capitulum is semicordate, about twice as long as wide, the occludent margin straight, carinal margin very convex, especially near the base.

The scutum consists of two straight branches at right angles, an occludent and a lateral portion. The lateral branch does not much

exceed one-third the length of the occludent, and is somewhat narrower, tapering to a blunt end. It joins the upright portion in a short curve. The occludent branch is nearly parallel-sided, but is a trifle wider in the middle. The summit or tergal border is oblique, close to the tergum.

The tergum is triangular, with the umbo on the carinal side, midway between the summit of the plate and the apex of the carina. A furrow runs from the umbo to the baso-occludent angle, opposite the apex of the scutum, where there is a slight notch. The occludent margin is convex; summit somewhat obtuse. The basal and carinal margins are nearly straight, the basal angle of the plate somewhat obtuse.

The carina is very strongly arched basally, less so toward the upper end. The roof is flat, and at the upper end as wide as the plate, tapering to a narrow keel at the base. The sides are broader than the roof, but taper upward. The base forms a broadly crescentic cup, half embracing the top of the peduncle, but the horns of the crescent are very short (fig. 33*b*, basal view).

The peduncle is very short, attached to the axis of a slender hydroid.

Length of the capitulum of the type, 8 mm.; width, 3.6 mm. Length of capitulum of No. 11860, 11 mm.; breadth, 5.7 mm.

This species is based upon two specimens, one of them, No. 11860, being evidently a quite old individual in which the carina is wider (fig. 33*d*). It is related to *Dichelaspis sessile* Hoek from off the Azores in 1,000 fathoms, but in that the scutum is decidedly broader. *Octolasmis hawaiense* is an allied form, in which the curve joining the two branches of the scutum is longer. (Figs. 33.)

OCTOLASMIS HAWAIENSE (Pilsbry).

1907. *Dichelaspis hawaiensis* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 184, pl. IV, fig. 5.

Localities.—Cat. No. 32893, U.S.N.M., *Albatross* Station 3810, off the south coast of Oahu, 211–253 fathoms; also No. 32894, *Albatross* Station 4081, off Puniawa Point, Maui, 202–220 fathoms.

The capitulum is strongly compressed, about twice as long as wide, with nearly straight occludent and convex carinal margin.

The scutum is boomerang shaped, forming a narrow band along the occludent margin and another obliquely across the base, the two straight portions being united by a curve. The occludent portion is slightly wider than the lateral, obliquely beveled above to a point, which is received in a notch of the tergum. The lateral portion is about half the length of the occludent, and extends more than half way across the side, above the incurved base of the carina.

The tergum is subtriangular in general outline. Its occludent mar-

gin is nearly straight, the carinal margin a little concave, the apex obtuse, truncated. A groove runs near and parallel to the occludent margin, terminating in a notch which receives the apex of the scutum.

The carina is very long, reaching nearly to the apex of the tergum. It is well arched throughout, and near the base is very strongly curved in, extending more than half way across the base of the capitulum, terminating in a slight expansion of the sides, partially clasping the peduncle, but not forked. The roof is slightly flattened in the upper part. The sides are wide in the lower two-thirds, tapering near the apex.

The peduncle is very short.

Length of capitulum, 5; breadth 2.25 mm.; length of the carina, 4.7 mm.; length of peduncle, 0.7 mm.

This species is related to the west Atlantic *O. americanum*, but differs in the shape of the scutum and the narrow, somewhat convex roof of the carina. Like other free-living species, it has the valves better developed than most of the forms living on the gills of crabs.

Nine specimens examined, the type lot of four individuals, the largest with capitulum 6.5 mm. long; one 5 mm. long and a very young one from Station 3810; and two of about equal size—capitulum 4.5, peduncle about 1.2 mm. long, from Station 4081.

A new description of a specimen from Station 3810 is given, the station number of the lot originally described having been lost, and the exact locality therefore unknown.

Subfamily ALEPADINÆ.

Plates varying from five, much reduced, to none; when present the umbones of scutum and carina are median or above the middle.

This group includes the genera *Conchoderma*, *Heteralepas*, *Alepas*, *Anelasma* and *Chætolepas*. From the shape of the vestigeal scutum and carina and the position of their umbones, it seems likely that the unknown fully armored progenitors of these nude or nearly nude forms were quite unlike *Lepas*, *Poecilasma*, or other allied pentaspidian genera. The cirri have spines arranged in a single continuous or interrupted whorl on each segment in *Alepas* and *Heteralepas*, but in *Conchoderma* the spines stand comb-like along the anterior side, as in *Scalpellum*, etc. The taxonomic value of this character remains to be determined. It has not yet received careful study in any large series of species.

Genus CONCHODERMA Olfers.

1814. *Conchoderma* Olfers, Der Gesellschaft naturforschender Freunde zu Berlin, Magazin für die neuesten Entdeckungen in der gesammten Naturkunde, Jahrg. VIII, drittes Quartal, 1814, p. 177, first species *C. virgatum*.

Otion of some authors.

Nude cirripedes, with the peduncle long, capitulum generally striped or maculate, with two to five small vestigeal widely separated plates; scutum at base of the orifice, two or three lobed, with the umbo near the middle on the occludent border; carina narrow arched, with the two ends nearly alike, umbo near the middle; sometimes it is wanting; terga small or, in adults, sometimes wanting. Lateral filaments numerous; mandibles with five finely pectinated teeth; maxillæ with distinct steps. Caudal appendages none. Cirri with the spines arranged comb-like.

Type.—*C. virgatum.*

These pelagic forms live on whales' "bonnets," turtles, the bottoms of ships, buoys, etc. The two species are nearly or quite world-wide in distribution. *C. virgatum* is a handsomely striped form, with the plates rather well developed, though small. *C. auritum* is readily known by the two large "ears" rising behind the positions of the terga. The terga and carina are very small, sometimes absent in adults.

CONCHODERMA VIRGATUM (Spengler).

Plate IX, fig. 1.

1790. *Lepas virgata* Spengler, Skrifter Naturh. Selskabet, I, pl. vi, fig. 9.
1851. *Conchoderma virgata* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 146.
1883. *Conchoderma virgatum* Hoek, Challenger Rep., Cirripedia, p. 55.

Localities.—Swansea, Wales, Jeffreys collection. No. 1623, Woods Hole, Massachusetts, U. S. Fish Commission. No. 12905, Woods Hole, Massachusetts, on bottom of ship from Swan Island, Caribbean Sea. Twelve miles southeast of Block Island, Rhode Island. Off Gay Head, Marthas Vineyard, on *Mola rotunda*, U. S. Fish Commission. No. 12013, *Albatross* Station 2713, between Nantucket and Cape Charles, on *Neptunus sayi*. No. 14139, Gloucester, Massachusetts, on bottom of ship from Mediterranean. No. 4272, San Francisco, California.

CONCHODERMA AURITUM (Linnæus).

Plate IX, fig. 2.

1851. *C. aurita* Linnæus, Darwin, Monograph on the Cirripedia, Lepadidæ, p. 141.
1872. *Otion stimpsoni* Dall, Proc. Cal. Acad. Sci., IV, p. 301.

Localities.—Atlantic: Swansea, Wales, Jeffreys collection. Woods Hole, Massachusetts, on bottom of a bark from Swan Island, Caribbean Sea. Cape Hatteras, from an iron buoy.

Bering Sea: Plover Bay, Siberia, on *Coronula diadema* from the throat of a humpback whale. W. H. Dall, 1865.

The specimens from Plover Bay, eastern Siberia, are those Doctor Dall referred to[a] as blotched with rose pink. They were taken from a humpback whale (*Megaptera versabilis* Cope) captured by Captain Redfield. I have seen no specimens from the coast of California.

[a] Proc. Cal. Acad. Sci., IV, 1872, p. 301.

Genus HETERALEPAS Pilsbry, new genus.

1851. *Alepas* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 156, exclusive of *A. parasita*.

Nude barnacles, with the muscular layer of the peduncle continued within the integument of the capitulum; scuta absent, or minute and chiefly chitinous; no other plates developed. Cirri long, many jointed, of the usual curved form, with spines in tufts on the distal ends of the segments. Jointed caudal appendages present. Attached to objects on the bottom.

Type.—H. rex (Pilsbry).

This genus comprises all the species referred to *Alepas* by Darwin, Hoek, Aurivillius, Gruvel, Annandale, and other authors, with the exception of *A. parasita* Rang, the type of *Alepas*. The type of *Heteralepas* is a large Hawaiian species originally described as *Alepas rex*.

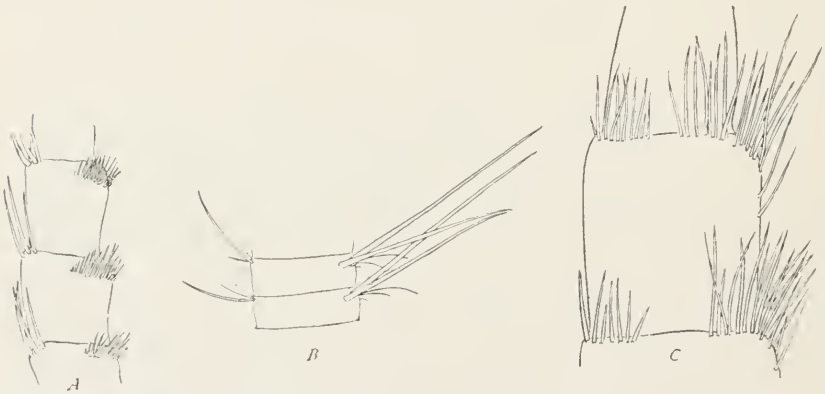

Fig. 34.—Segments from the 6th cirrus of (*A*) Paralepas percarinata, (*B*) Heteralepas rex, and (*C*) Alepas pacifica

Heteralepas consists of two series of species, which will probably be separated eventually as distinct genera.

In typical *Heteralepas* the inner rami of cirri v and vi are greatly reduced in size and number of segments, with the spines of the anterior border atrophied, small and weak. The outer rami of cirri v and vi, and both in cirri ii to iv, are very long, composed of extremely numerous short segments, each armed with two or three very long spines and three or two minute ones at the anterior distal angle, and a group of several small spines at the posterior distal angle (fig. 34*B*, two intermediate segments of cirrus vi of *H. rex*).

In the new subgenus *Paralepas* the cirri ii to vi have subequal rami of comparatively few segments, each armed with a semicircular brush of many short spines on the anterior face and a group of several (about three) long stout spines at the posterior distal angle of each

segment (fig. 34.1, 13th and 14th segments of outer ramus, cirrus vi, *H. percarinata*, type of the subgenus *Paralepas*).

The armature of the cirri in *Paralepas* is much like that of *Alepas*, but the whorls of spines are more broadly interrupted on the sides of the cirri, and the cirri themselves are much better developed. Moreover, caudal appendages are well developed in *Paralepas*, composed of several segments, as in *Heteralepas*, while in *Alepas* they are wanting or composed of a single short segment.

Heteralepas (*Paralepas*) *pedunculata* Hoek, reported as taken by the *Challenger* at Station 164 A, off Sydney, New South Wales, on a spine of *Phormosoma hoplacantha* Agassiz, is probably not from Australian waters, but from a mid-Atlantic station. See under *Megalasma gracile*, p. 89. *Heteralepas* (*Paralepas*) *minuta* (Philippi) is in the Museum from the Zoological Station at Naples.

The following forms have been described from Antillean waters:

Heteralepas cornuta (Darwin), St. Vincent.

Heteralepas lankesteri (Gruvel), Mona Channel.

Heteralepas belli (Gruvel), coast of Cuba.

HETERALEPAS CYGNUS, new species.

Type.—Cat. No. 32920, U.S.N.M.

Type-locality.—Monterey, California, Ward's Natural Science Establishment. Depth and nature of support unknown.

The capitulum is oval, its width about three-fourths of the length, not much compressed, the diameter being about half of the length; distinctly differentiated from the peduncle, strongly keeled dorsally, integument transversely wrinkled, without hairs or bristles. The orifice is ovate, somewhat exceeding one-third the length of the capitulum. The occludent margin below the orifice is convex.

The peduncle is very long, about three times the length of the capitulum, cylindric, conspicuously wrinkled transversely, widest near the base, tapering slowly to about two-thirds the greatest width at the neck where it joins the capitulum. Along its dorsal side a low ridge continues the keel of the capitulum.

The color is light yellow, sometimes a shade darker, slightly brownish, on the peduncle.

Length of capitulum 23, breadth 18, diameter 12.5 mm. Length of the peduncle 70 mm., breadth near the base 12.5, near the capitulum 8 mm. (Fig. 35.)

The mandible (Plate V, fig. 8) has four strong subequal teeth, the lower three equally spaced, the upper one separated by a space nearly twice the width of the others. There is a brush of fine hairs on the upper edge, another on the lower.

The maxilla (Plate V, fig. 7) has the border excavated below the two large spines at the upper angle, the embayment armed with but few

small spines. The lower half is closely spinose. There is a large hairy area at the lower angle, and a small one on the upper border.

The first cirri have very unequal branches, of 14 and 29 segments, respectively. They are densely armed with whorls of slender spines. The rest of the cirri are very long and slender, with spines on the anterior side, two or three in each group being large. Distally there are groups of small spines on the posterior side also. The general arrangement of these spines conforms to that described in *H. rex*. The rami are subequal in cirri ii, iii, and iv, but in v and vi the endopod is greatly reduced, about half as long as the exopod, very slender, and composed of 28 segments in the fifth cirrus (Plate V, fig. 13), 25 in the sixth.

The terminal appendage (Plate V, fig. 12) is nearly 4 mm. long, about one-seventh the length of the sixth cirrus, composed of eight or nine segments, and without bristles.

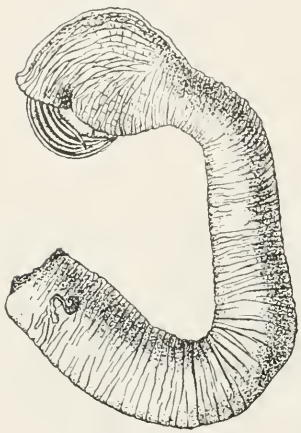

FIG. 35.—HETERALEPAS CYGNUS, NATURAL SIZE.

The long penis is closely annulate, acuminate at the distal end, where it bears a minute pencil of delicate hairs.

This species is related to *Heteralepas indica* (Gruvel) described from Singapore, and *H. gigas* Annandale, which have the peduncle similarly lengthened. In all other known forms the peduncle is very much shorter. *H. indica* differs from *H. cygnus* by its much compressed capitulum, not distinctly separated from the comparatively wider peduncle; by its dark chestnut, slightly vinous color, the smoother cuticle of the capitulum, which has a few small tactile bristles ("*soies sensitives*"), and by the different arrangement of spines on the cirri. The terminal appendage in *H. indica* has twelve segments, the last four bearing bristles, and terminating in a bunch of bristles, whilst in *H. cygnus* there are but eight or nine segments, none of them setose. The mandible in *H. cygnus* has more slender teeth, with a fringe of bristles on the lower margin, wanting in *H. indica;* and the penis is more conspicuously and closely annulated.

Heteralepas gigas (Annandale)[a] is a larger species than *H. cygnus*, with the peduncle similarly lengthened. It has "short, stout hairs scattered singly" on the capitulum, and large, feebly differentiated scuta, thereby differing from *H. cygnus*.

[a] *Alepas gigas* Annandale, Mem. Asiatic Soc. of Bengal, I, 1905, p. 80. Bali Straits, 160 fathoms.

Heteralepas quadrata (Aurivillius), from Lower California, on *Lepas*, is the only species of this genus hitherto reported from the west coast of North America. It was described as an *Alepas*, and is known to me by the original account only.

HETERALEPAS (PARALEPAS) PERCARINATA (Pilsbry).

1907. *Alepas percarinata* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 185, pl. IV, fig. 8.

Localities.—This Hawaiian species is represented by specimens from *Albatross* stations 4081, 4082, 4083, 4084, all off the north coast of Maui in 202 to 267 fathoms; Station 3835, south coast of Molokai, 169 to 182 fathoms, and Station 3912, north coast of Molokai, 334 fathoms. The bottom temperature ranges from 43° to 55° F. These stations are additional to those mentioned in the original description.

Genus ALEPAS Rang.

1829. *Alepas* Sander Rang, Manuel de l'histoire naturelle des Mollusques, p. 364, for *A. parasita* Rang (May, 1829). Not *Alepas* of subsequent authors.

1894. *Gymnolepas* Aurivillius, Kongliga Svenska Vetenskaps-Akademiens Handlingar, XXVI, No. 7, p. 33, type, *G. pellucida*. Not *Gymnolepas* Blainville, 1824.

1897. *Eremolepas* Weltner, Archiv für Naturgeschichte, Jahrg., 1897, I, p. 239, substitute for *Gymnolepas* Aurivillius.

Nude pedunculate barnacles with the integument of the capitulum very thin, without an internal muscular layer, and typically having a pair of very small, irregularly lobed, imperfectly calcified scuta; cirri nearly straight, very short, and weak, the rami with 6 to 12 segments, each segment armed with a continuous or interrupted circle of spines. Caudal appendages wanting or of one short joint. Penis hairy. Pelagic, attached to medusæ.

Type.—*A. univalvis* Quoy and Gaimard.

The type of this genus, *Alepas univalvis*, is known solely by the insufficient description of Quoy and Gaimard,[a] published more than

[a] 1827. *Anatifa univalvis* Quoy and Gaimard, Annales des Sciences Naturelles, X, Zoologie, p. 234, pl. VII, figs. 8, 8*a*. Strait of Gibraltar.

1829. *Alepas parasita* Rang, Manuel de l'Hist. Nat. des Moll., p. 364, pl. VIII, fig. 5, based on the same specimens.

1834. *Anatifa parasita* Quoy and Gaimard, Voyage de l'Astrolabe, Zoologie, III, p. 641, pl. XCIII, figs. 1–3.

——. (?) *Triton* (*Alepas*) *fasciculatus* Lesson, Voyage autour du Monde de La Coquille, Zoologie, II, Pt. 1, p. 442, pl. XVI, fig. 6.

1851. *Alepas parasita* Rang, Darwin, Monograph on the subclass Cirripedia, Lepadidæ, p. 163.

Lesson's figure is very poor, and does not agree with the description. If the cirri are correctly figured, a species different from *A. univalvis* is indicated.

three-quarters of a century ago. The later accounts in the monographs of Darwin and Gruvel are compiled from Quoy and from Lesson, who described a similar form, perhaps specifically identical. According to Quoy, the tunic is gelatinous and diaphanous; the cirri are short, quite broad, and straight, white (though colored blue on the plate in the *Astrolabe* voyage), and composed of about 10 segments. An isolated cirrus figured shows rami with 12 segments. The total length is nearly 2 inches. Nothing is said of caudal appendages.[a]

This account, so far as it goes, applies so well to the Pacific species described below that I can not doubt that the two forms are very closely related and possibly identical specifically. It is, moreover, evident that *Gymnolepas pellucida* Aurivillius, based upon a specimen about 1 inch long, is closely related to *A. univalvis*, though probably distinct specifically. The genus will therefore include three species:

Alepas univalvis (Quoy and Gaimard). Eastern Atlantic.

Alepas pellucida (Aurivillius). North Atlantic.

Alepas pacifica Pilsbry. Eastern Pacific.

Alepas, as here restricted, differs from the genus *Heteralepas* by its thin-walled integument, the absence of segmented caudal appendages, and by the short, few-jointed, and weakly chitinized cirri. These are adaptive characters, correlated with pelagic conditions.

The arrangement of spines on the cirri is much alike in *Alepas* and *Paralepas*. In *A. pacifica* there is, on the more anterior cirri, a complete circle of spines around the distal end of each segment. On the last two or three cirri the circle is more or less interrupted, both on the outer and inner faces of the rami. This is most pronounced in the sixth cirrus, the fifth segment of which is illustrated in fig. 34 *C*, page 100. Except that the first cirrus is more profusely spinose along the anterior side, it does not differ in armature from the adjacent cirri. Aurivillius has figured a cirrus of his *Gymnolepas pellucida* with the same arrangement of spines described above for *A. pacifica*.

[a] Darwin *infers* the presence of "a pair of long articulated caudal appendages" from Lesson's statement that his *Triton* (*Alepas*) *fasciculatus* has seven pairs of cirri. In no allied form are the caudal appendages so large as to be mistaken for cirri, and it is far more probable that Lesson miscounted the cirri—a mistake very easy to make where they lie limp and tangled, as I have noticed in *A. pacifica*. The inference that *A. univalvis* (*A. parasita*) has caudal appendages depends, moreover, upon the identity of the form badly described by Lesson with that of Quoy and Gaimard—a proposition which can not be considered as demonstrated. In Gruvel's monograph Darwin's *inference* as to presence of caudal appendages is adopted as a matter of fact.

ALEPAS PACIFICA, new species.

Type.—Cat. No. 28797, U.S.N.M.

Type-locality.—Sea north of San Francisco, California, taken from a jelly fish, March 26, 1894, Stanford University.

The capitulum has thin walls, collapsing in alcohol. The occludent margin is straightened, slightly protruding along the orifice, the carinal margin regularly arched. The width of the capitulum is about two-thirds its length. At the base of the orifice there is a pair of imperfectly calcified, rather indistinct white scuta. So far as can be made out, each consists of a narrow band along the occludent border, with two narrow divergent lateral lobes. The orifice is ample, occupying a little more than half the length of the capitulum. It is continued as a superficial slit in the outer tunic nearly to the base. The integument is smooth, of a dull grayish-buff tint, and, while somewhat thickened along the dorsal border, there is no keel or angle there. No tubercles, hairs, or tactile organs of any kind are visible.

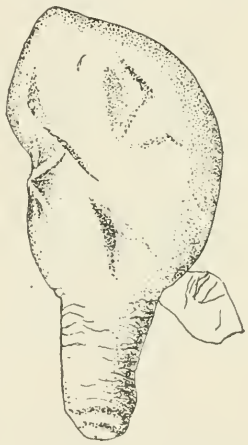

Fig. 36.—Alepas pacifica, natural size.

The peduncle is shorter than the capitulum, oval in section, but collapsing in the alcoholic specimens, tapering slightly toward the base of attachment. Its integument is nearly smooth and colored like the capitulum.

Length of capitulum 36, greatest width 25 mm. Length of the peduncle 20, width in the middle 11 mm.

The mandible (Plate V, fig. 2) has six teeth, counting the lower point. The upper tooth is acuminate and curved; the rest are of the usual shape, the lower ones smallest. There is some short pubescence upon the lower teeth and on the margin below them.

The maxilla (Plate V, fig. 1) is peculiar. There is a single large spine at the upper angle and a deep excavation of the edge below it. The rest of the edge protrudes and is irregularly spinose, the spines being very short. There is some fine and short pubescence at the lower angle.

The cirri are all short, the first (Plate V, fig. 5) with shorter, more lanceolate rami than the others. All have whorls of delicate bristles, longer and more numerous on the anterior side (Plate V, fig. 4, third cirrus). The second to fifth cirri are of about equal length, the sixth longer. The rami of cirrus i are composed of 6 and 7 segments, ii and iii of 8, iv and v of 10, vi of 10 and 12 segments.

The penis (Plate V, fig. 6) is stout and short, with only weak annulation, chiefly in the median portion, and it is clothed with rather long delicate hairs, which seem to be irregularly placed.

The imperfectly calcified scuta are shaped much like those of *Conchoderma virgatum* var. *hunteri*, but with an additional diverging lobe or ray below. Owing to the absence of definite outlines, the shape of the plate is not clearly to be seen.

The type is a large individual, with a young one adhering at the base of the capitulum. Several other smaller examples were taken with it. *A. pacifica* is a much larger form than *A. pellucida* (Aurivillius) of the Atlantic. The integument is also less transparent. The arrangement of the teeth of the mandible is different, those of *A. pacifica* being more equally spaced, without a wider space below the upper spine. The maxillæ also are unlike in the Atlantic and Pacific species, that of *A. pacifica* being remarkable for the very short spines and the very irregular edge.

A. pacifica must be compared with *A. univalvis* (Quoy and Gaimard) of the eastern Atlantic. That form is at present known only by very inadequate descriptions and figures, and its exact structure remains to be investigated. From existing data it seems to be very similar to the Pacific form; yet the specific identity of forms so widely separated geographically could not prudently be affirmed without a comparison with Atlantic material. The essentially pelagic habit of the genus leads us to anticipate wide dispersion of the species, limited only by the distribution of the large medusæ which serve as their hosts. (Fig. 36.)

Family VERRUCIDÆ Darwin.

Sessile, box-like, asymmetrical barnacles, in which the wall is composed of the rostrum, carina, a scutum, and a tergum, immovably interlocked, and all much specialized in shape; the other scutum and tergum are movable, forming the lid-like top. Caudal appendages are very long, composed of numerous segments.

This very distinct family consists at present of a single genus.

Genus VERRUCA Schumacher.

1817. *Verruca* Schumacher, Essai d'un nouv. syst. Vers Testacés, p. 91.
1851. Darwin, Monograph on the Cirripedia, Balanidæ, p. 496.

Doctor Hoek, in describing the deep-water species obtained by the *Challenger*, has commented upon the similarity of the several forms, and expressed grave doubts as to their specific value. Individuals are much rarer than in *Scalpellum* or *Pœcilasma*, most of the forms being known by only one, or at best by very few examples, so that we have little opportunity to ascertain the ordinary range of individual variation. The characters of sculpture upon which the species are largely

based, change somewhat with age, and without a series of specimens it is often difficult to tell whether a form in hand is young or mature. The general contour is certainly affected by the shape of the supporting surface; and any species may occur with the movable valves on either the right or left side. Gruvel and Aurivillius have described a considerable number of forms, many of them very closely related, from the eastern Atlantic; so that the study of *Verruca* is now by no means a light task.

Among the species taken in the western Atlantic and Antilles by the *Albatross* I have been able to recognize only one previously described form, the *Verruca nexa* of Darwin, which was taken at one station off Habana. The forms described below as *V. euglypta* and *V. calotheca* belong to a group of closely related species or races, widespread in deep water, yet they present minor features which bar their identification with any forms hitherto described and figured. *Verruca darwini* stands near *V. nitida* Hoek, from the Moluccas; *V. hoeki*, on the other hand, is quite distinct from other described species.

No other forms of this family are known from North American waters.

VERRUCA NEXA Darwin.

Locality.—Cat. No. 9496, U.S.N.M., *Albatross* Station 2324, north latitude 23° 10′ 25″, west longitude 82° 20′ 24″, off Habana, Cuba, in 33 fathoms.

In some of the specimens there are strong vertical ribs on the fixed scutum and tergum, while in others of the same group the wall on that side is nearly smooth.

VERRUCA NEXA ALBA, new subspecies.

Plate XI, figs. 7, 8.

Type.—Cat. No. 9474, U.S.N.M.

Type-locality.—*Albatross* Station 2317, Straits of Florida, north latitude 24° 25′ 45″, west longitude 81° 46′ 45″, in 45 fathoms on a sea-urchin spine.

This form resembles *V. nexa* in size and general shape of the plates, but the movable scutum is convex between apex and basal margin, the former being depressed and somewhat twisted; the two articular ridges are weaker. The rest of the plate has three strong, slightly beaded radial ribs. The movable tergum has four articular ridges, the second one very small. The apices of the fixed scutum and tergum are produced in short, stout beaks. Both carina and rostrum have several short, curved ribs terminating on the hinge-line of the movable plates, and each has one very large articular rib, ending in a long interlocking tooth. The shell is white. Length 4, breadth 2.7, altitude 1.7 mm.

Another specimen on the same spine has four strong, subequal

radial ribs on the movable scutum, exclusive of the articular ribs, and the second articular rib of the movable tergum is nearly as large as the others. In other characters, especially in the convex scutum, it agrees with the type-specimen.

In a number of examples of *V. nexa* Darwin which I have examined, the movable scutum is flat, and the articular ribs and interlocking teeth of carina and rostrum are more numerous and subequal. Probably *V. n. alba* might better be considered a distinct species; yet with only two examples I prefer to rank it as a subspecies. The produced beaks of the fixed scutum and tergum, densely marked with growth-lines, give reason for believing the individuals quite adult. The shell is white, like most other Verrucas, not ruddy like all of the *V. nexa* I have seen.

VERRUCA EUGLYPTA, new species.

Plate X, figs. 1, 2, 3.

Type.—Cat. No. 32906, U.S.N.M.

Type-locality.—*Albatross* Station 2415, off South Carolina, latitude 30° 44′ north, longitude 79° 26′ west, in 440 fathoms, bottom temperature 45.6° F.

The shell is cream-white, seated transversely upon a branch of Oculina-like coral, much narrower than the barnacle, the base of which is consequently contracted, the end walls overhanging. The scuto-tergal wall is vertical, the rostro-carinal wall slopes steeply. The movable scutum and tergum lie at an angle of about 45° with the plane of the base. All of the plates are very deeply and closely sculptured with riblets in the direction of growth-lines, wider than the intervening furrows.

The movable scutum is subtriangular, curved, with the surface divided into two areas. The larger occludent area is sculptured with transverse riblets, the smaller area with four arcuate articular ridges. The first ridge is smooth, and about one-third the length of the plate; the other ridges are cut by the transverse riblets, the second articular ridge being narrowest and not reaching quite to the apex; hence a quite young individual would have but three articular ridges. The furrows between the ridges are smooth.

The movable tergum is much larger than the scutum, quadrangular, the occludent margin somewhat shorter than the basal and parallel to it, the carinal margin slightly arcuate, the articular margin coarsely zigzag. The surface is divided into two nearly equal areas by the slightly curved diagonal last articular ridge, the area below it being depressed, flat, and marked with transverse riblets only. There are four articular ridges, the third narrowest, the fourth widest and in strong relief. All are sculptured with the transverse riblets, but on the first ridge they are very low, fine and delicate, and arch down-

ward, while on the others they are straight and wide. They are prominent, oblique, and lamellar in the first articular furrow, less conspicuous in the others. The second and third articular ridges unite near the apex, so that in a quite young stage there are but three articular ridges, of about equal width.

The fixed scutum is divided into two nearly equal large areas, and a third very narrow area next the tergum. The rostral area is regularly sculptured with plain transverse riblets. The median area is triangular, raised above the others, with the transverse sculpture irregular, rude, and interrupted by a number of irregular radial grooves or indistinct sulci. Near the base it articulated with the rostrum by a single tooth. The tergal area is a very narrow obliquely costulate segment not reaching to the base and separated from the median area by a deep furrow.

The fixed tergum stands erect, surrounding two sides of the movable tergum, as viewed from above, hence its scutal and carinal walls stand at right angles. Its surface is divided into three areas. The scutal and carinal areas are triangular, reaching only about halfway to the base, and are regularly sculptured with obliquely transverse riblets. The median area stands in high relief, extends to the base, and has wide, rather rude, and flat transverse sculpture, the grooves being linear and shallow. There is a poorly developed articular ridge along the carinal edge of the plate.

The carina is bent so that its two faces stand at right angles. A broad rostral triangle is occupied by five radial ridges forming as many teeth articulating with the rostrum. These ridges are crossed by the transverse sculpture. Three of them extend to the apex of the plate, the others being shorter and peripheral, therefore wanting in the young stage. There is also a prominent radial ridge and a furrow along the other margin of the plate, articulating with the fixed tergum. The intermediate area, comprising a moiety of the surface of the plate, has a rude sculpture of wide, flat, transverse pleats parted by shallow linear grooves.

The rostrum is like the carina in general shape. On its carinal face there are five radial ridges, of which two or three arise at the apex, the second ridge being widest. The rest of the plate has rude, flat sculpture like that of the carina. Near the fixed scutum there are several radial grooves and furrows. The apex of the rostrum projects more than that of the carina.

Greatest carino-rostral length 11.2 mm.; greatest breadth (at right angles to length) 9.4 mm.; height from base to apex of the fixed tergum 7.8 mm.

This fine species is related to *V. radiata* Gruvel,[a] described from

[a] Exped. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 94, pl. II, figs. xix, xx.

an individual only 3 mm. long, but it differs by the better developed articular ridges of the movable scutum, which in *V. radiata* occupy a comparatively much narrower portion of the surface; by the less curved ridges of the movable tergum, the weak radial grooves of the fixed scutum, etc. *V. euglypta* of the same size as the type of *V. radiata* would evidently be quite unlike that species.

The rostrum, carina, fixed scutum, and fixed tergum, when the plates are detached, are seen to be conspicuously vaulted or decked over near the beaks. No such structure is seen in *V. calotheca*, in which the plates are simple inside.

VERRUCA CALOTHECA, new species.

Plate XI, figs. 1, 2, 3.

Type.—Cat. No. 32907, U.S.N.M.

Type-locality.—*Albatross* Station 2415, north latitude 30° 44′, west longitude 79° 26′, 440 fathoms, on *Scalpellum superbum*.

The shell is white, depressed, with subcircular base, slightly wider than long; end walls vertical; carino-rostral wall sloping outward, the opposite (scuto-tergal) wall overhanging. The movable scutum and tergum lie nearly parallel to the plane of the base.

The movable scutum is subtriangular, its surface divided into two areas of nearly equal size. The outer area is sculptured with wide transverse ribs parted by much narrower interstices. The tergal area has four arcuate articular ridges, the middle two deeply cut into transverse tubercles; fourth rib narrower and less deeply sculptured; first rib delicately striate transversely.

The tergum is quadrangular, the upper margin shorter than the basal, the carinal margin arcuate. The surface is divided into two subequal areas, the carinal area transversely ribbed. Scutal area sculptured with four articular ribs, the first finely sculptured with thin arcuate transverse lamellæ, the other ribs transversely cut into tubercles, which have the imbricating appearance of roof tiles. The second rib is the smallest, and hardly reaches to the apex, which is somewhat recurved. The furrow between the first and second ribs is wider than the others.

The fixed scutum is quadrangular, with parallel upper and basal margins. The apex is somewhat recurved and produced. A diagonal rib from the apex divides the surface into equal triangles. The upper or occludent triangular area is sculptured with irregular, rather widely spaced, vertical grooves and two shallow radial furrows. The lower area has a rather rude, irregular, and weak sculpture of grooves parallel to the base. The tergal margin is straight and vertical.

The fixed tergum is very irregular in shape. The surface is radially divided into three areas, the middle one triangular and raised, without distinct sculpture. The scutal area is sunken, rather narrow, and very obliquely, finely costulate. The carinal area is wide, obliquely

triangular, and sculptured transversely with rather widely spaced grooves, which are waved downward near the sides of the area. The base of this area is formed by the carina.

The carina has a recurved, overhanging apex. The surface is divided into two areas, that below the beak being concave and weakly, irregularly wrinkled parallel to the base. The rostral area is sculptured with four slightly curved oblique ribs, the upper one much the largest, the lower one very small. These ribs have roof-tile-like sculpture, and their ends interlock with those of the rostrum. The furrow between the first and second ribs is much wider than the other furrows.

The rostrum is shaped much like a mirror image of the carina, but the wall below the beak is vertical, not concave, and there is a ledge above, with two beaded radial ribs curving toward the movable scutum. Below this ledge there is a very strong rib articulating at the end with the carina, and below it two minor ribs, all transversely grooved, the grooves narrow, intervals not much raised. The rest of the plate has irregular wrinkles parallel to the base.

Greatest carino-rostral length, 5.9 mm.; width at right angles to length, 4 mm.; height from base to apex of the fixed tergum, 3 mm.

This species differs from others having the movable plates parallel to the base by the sculpture of four articular ribs, other species of similar form having three or five ribs. *V. calotheca* was taken at the same station as *V. euglypta*. It differs from that species conspicuously in the flat top and the shape and sculpture of the plates forming the wall and in the simple, open interior. In *V. euglypta* the plates of the wall are vaulted toward their apices inside.

VERRUCA DARWINI, new species.

Plate X, figs. 4–7, 8.

Type.—Cat. No. 9015, U.S.N.M.

Type-locality.—*Albatross* Station 2042, east from Cape May, north latitude 39° 33′, west longitude 68° 26′ 45″, in 1,555 fathoms.

The shell is white, much elevated, seated lengthwise on the slender spine of a sea urchin; the base therefore is long and narrow, partially clasping the spine, and the side walls overhang. The movable scutum and tergum slope steeply at an angle of about 45° with the base. All of the plates are concentrically sculptured with wide, flat pleats.

The movable scutum is sculptured with wide transverse pleats, cut by an arcuate sulcus running from apex to the baso-tergal angle, cutting off an arcuate articular ridge. The small area between this rib and the tergal margin is closely sculptured with fine riblets parallel to the latter.

The quadrangular movable tergum is divided into two areas by a well-raised, arcuate diagonal rib from apex to baso-scutal angle. The

tergal area has sculpture of wide, flat, transverse ribs parted by narrow grooves. The scutal area has pleats at right angles to those of the other area. There is a radial depression near the upper margin, and a weak elevation, hardly to be called a rib, near the lower diagonal rib.

The fixed scutum is irregularly subtriangular, with the apex curved strongly toward the tergum, not projecting; its surface is divided into three areas: the median area widest, flat, with sculpture of very wide, flat pleats, weakly, irregularly striate parallel to the pleats; the rostral area is narrow, forming part of the rostral wall, sculptured with pleats deeper than those of the median area and at right angles to them; the tergal area is very narrow, not reaching to the base, obliquely pleated, and separated from the median area by a ledge, being depressed below the level of the latter.

The fixed tergum has two faces nearly at right angles, and is divided into three areas: the scutal area is triangular, does not reach the base, and is sculptured with vertical pleats; a deep, narrow furrow separates it from the median area. The median area has sculpture of wide, flat pleats, which are angulate or V-shaped except near the apex, where they are close and straight. The carinal area has oblique pleats, situated where they pass over the rounded rib at the occludent margin.

The carina is quadrangular, with parallel tergal and basal margins, its surface divided by a weak diagonal groove into two triangular areas. The lower area has weak sculpture of widely spaced grooves parallel to the basal margin. The rostral area has a strong, narrow rib along the upper margin, followed by a deep furrow. Below this there are weak indications of two wide radial ribs, indicated more by the curvature of the pleats running over them than by actual elevation of the ribs themselves. The umbo projects a little.

The rostrum is quadrangular with slightly projecting umbo. It has two curved, radial articular ridges, the upper one strong, the lower low and wide. Above the upper rib there is a narrow excavated area forming a ledge along the base of the movable scutum. In this area there are a few weak radiating riblets.

Greatest carino-rostral length, 11 mm.; greatest breadth, 6 mm.; height from base to apex of the fixed tergum, 8.7 mm.

The high, compressed shape, wide, pleat-like sculpture, and steeply sloping movable valves, with only one or two articular ridges, are characteristic features. It is closely related to *V. nitida* Hoek, from the Moluccas; but it differs by being twice the size of that species, with the suture uniting rostrum and carina coarsely zigzag, with three major projections on the carina and two on the rostrum. In *V. nitida* there is a single strong upper tooth, the suture below it being straight.

There are two specimens, the type and another taken with it. The latter (Plate X, fig. 8) is shorter and wider than the type. The mov-

able scutum has two very distinct arcuate ribs. The interlocking ribs of the carina and rostrum, below the strong upper ones, are more distinct. The ledge-like area between the upper articular ridge of the rostrum and the movable scutum is much wider, with strong rib-sculpture, and two narrow curved ribs. Greatest carino-rostral length, 8.5 mm.; breadth, 6.7 mm.; height, 6.7 mm. These specimens seem to show that there may be considerable individual variation in *Verruca*, if, indeed, the differences between them are individual and not racial. In all other cases where I have been able to compare a number of examples they have proved to be very constant.

VERRUCA HOEKI, new species.

Plate XI, figs. 4, 5, 6.

Type.—Cat. No. 1493, U.S.N.M.

Type-locality.—*Albatross* Station 2750, north latitude 18° 30′, west longitude 63° 31′, Anegada Passage, in 496 fathoms, bottom temp. 44.5° F.

The shell is small, gray-white; laterally much compressed, the base narrowly oval; very high, conspicuously leaning; the movable plates lying parallel with the wall below them; sculpture very weak.

The movable scutum is small, triangular, the apex but little curved. The occludent and tergal margins curve down, the plate being thus a little convex at the sides, flat in the middle. Except for a few faint, widely spaced transverse grooves there is no sculpture.

The tergum is nearly square, the upper margin a trifle shorter than the others. It is divided into two triangles by a diagonal rib from apex to baso-scutal angle. The scutal triangle has faint sculpture of spaced grooves parallel to the scutal margin; the other area has similar faint vertical grooves. The suture between scutum and tergum is straight and simple.

The fixed scutum is quadrangular, margins straight; the side margins vertical, at right angles to the base; the upper margin slopes steeply. The apex is acute and projects a trifle. The surface is weakly marked with growth lines and faint vertical striæ.

The fixed tergum is high and narrow, five-sided. The basal margin is short, the side margins long, diverging upward. The upper margins converge to the pointed apex.

The rostrum rises to an acute, slightly recurved apex; it is curved, forming the rounded end of the wall. Three weak ribs radiate from the apex to the carinal margin.

The carina is lower than the rostrum, square, the apex acute, slightly projecting. A low rib along the upper margin terminates in a lobe indenting the suture with the rostrum, which is elsewhere an even line.

Length of the base, 3.6 mm.; length from apex of rostrum to that of carina, 3.2 mm.; greatest width of base, 1.9 mm.; oblique height from base to apex of the fixed tergum, 4 mm.

The four specimens taken are alike in the compressed shape, steeply leaning posture, and other characters described above. Three lean toward the right, as viewed from the opercular side, and one toward the left. All lean also toward the side of the fixed scutum and tergum. The narrow base and compressed shape are not due to a narrow support, for all the specimens were seated upon flat, frond-like polyzoan colonies, wider than the barnacles.

This species represents quite a distinct form of the genus, *V. obliqua* Hoek being nearer than any other, but differing in many respects. It is respectfully dedicated to Dr. P. P. C. Hoek, who ably worked up the *Challenger* Cirripedia.

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EXPLANATION OF PLATES.

Plate I.

Figs. 1–5. *Scalpellum stroemii* Sars. Series of a form from St. Peter's Bank, showing changes with age. Cat. No. 21547, U.S.N.M.

6, 7. *Scalpellum stroemii* Sars. Typical Norwegian specimen in side and ventral views.

8, 9, 10. *Scalpellum stroemii substroemii*, new subspecies, *Albatross* Station No. 2693.

11, 12. *Scalpellum stroemii latirostrum*, new subspecies. Type, Cat. No. 10780, U.S.N.M., *Albatross* Station No. 2527.

13, 14. *Scalpellum stroemii latirostrum*, new subspecies. Cat. No. 10752, U.S.N.M., *Albatross*, 1885.

15, 16. *Scalpellum stroemii latirostrum*, form having some features of *substroemii*. Cat. No. 9020, U.S.N.M.

Plate II.

Fig. 1. *Scalpellum giganteum* Gruvel. Side view of specimen largely denuded of the cuticle, from *Albatross* Station 2658. Natural size.

2, 3. *Scalpellum regium latidorsum*, new subspecies, dorsal and lateral views of type. Natural size.

4. *Scalpellum regina*, new species. Diagrammatic section of carina.

5, 6. *Scalpellum regina*, new species. Detail of base of carina, and lateral view of type. Natural size.

7. *Scalpellum regium latidorsum*, new subspecies. Section of carina, diagrammatic.

8. *Scalpellum regium* Wyville Thomson. Section of carina, diagrammatic.

9, 10. *Scalpellum regium*, variety from Station 3342 in the Pacific. Dorsal and lateral views. Natural size.

Plate III.

Fig. 1. *Scalpellum giganteum* Gruvel. Side view of an old specimen showing sutural lines between the imperfectly calcified plates. Natural size.

2. *Scalpellum velutinum* Hoek. Group of ten individuals. Cat. No. 12480. Natural size.

3. *Scalpellum velutinum* Hoek. Group, showing adult and young individuals in carinal aspect. Natural size.

4, 5. *Scalpellum regium* Wyville Thomson. Cat. No. 8629, U.S.N.M.

Plate IV.

Figs. 1–5. *Scalpellum stearnsii* Pilsbry. 1, first cirrus; 2, terminal appendage; 3, segment from middle of sixth cirrus, anterior side toward the left; 4, mandible; 5, maxilla.

6–8. *Scalpellum regium* Wyville Thomson. 6, mandible; 7, lower point of same, much enlarged; 8, terminal appendage.

9. *Scalpellum aurivillii*, new species. An intermediate segment of the sixth cirrus, anterior side on the right.

10–12. *Scalpellum regium*, variety from *Albatross* Station, 3342. 10, first cirrus; 11, maxilla; 12, mandible.

13. *Scalpellum aurivillii*. Terminal appendage.

14. *Scalpellum regium*, var. from Station 3342. Terminal appendage.

15–18. *Scalpellum imperfectum*, new species. 15, intermediate segment from sixth cirrus; 16, terminal appendage; 17, mandible; 18, lower tooth and lower point of same, more enlarged.

Plate V.

Figs. 1, 2. *Alepas pacifica*, new species. Maxilla and mandible.
3. *Scalpellum auriviIlii incertum*, new subspecies. Mandible.
4–6. *Alepas pacifica*, new species. Third and first cirri and penis.
7, 8. *Heteralepas cygnus*, new species. Maxilla and mandible.
9. *Scalpellum auriviIlii incertum*. Maxilla.
10, 11. *Pœcilasma kæmpferi* Darwin. Maxilla and mandible of a Japanese example.
12, 13. *Heteralepas cygnus*. Terminal appendage and portion of the sixth cirrus, anterior side on the left side of the figure.
14. *Megalasma annandalei*, new species. Intermediate segment from sixth cirrus, anterior side on the right side of the figure.
15. *Scalpellum auriviIlii*, new species. Mandible.
16. *Megalasma gracile gracilius*, new subspecies. Maxilla.

Plate VI.

Figs. 1, 2. *Pœcilasma kæmpferi litum*, new subspecies. Lateral and ventral views.
3, 4, 5. *Pœcilasma kæmpferi* Darwin. Japan. Interior of scutum, interior and lateral views of carina.
6, 7. *Pœcilasma inæquilaterale*, new species. Lateral and ventral views of the type.
8. *Pœcilasma inæquilaterale*, new species. Interior of scutum of a specimen from off Key West.
9, 10. *Pœcilasma inæquilaterale brere*, new subspecies. Ventral and lateral views of the type.
11, 12. *Pœcilasma inæquilaterale*, new species. Lateral and ventral views of a topotype.
13, 14. *Pœcilasma kæmpferi noræanglix*, new subspecies. Lateral and ventral views of the type.

Plate VII.

Figs. 1–5. *Megalasma subcarinatum*, new species. Lateral and dorsal views of type; interior of scutum; inside and lateral views of the carina.
6–9. *Megalasma gracile gracilius*, new subspecies. Lateral view of type; interior of scutum; inside and lateral views of carina.
10–14. *Megalasma rectum*, new species. Lateral and dorsal views of type; interior of scutum; inside and lateral views of the carina.
15–19. *Megalasma annandalei*, new species. Lateral and dorsal views of the type; interior of scutum; inside and lateral views of the carina.

Plate VIII.

Fig. 1. *Lepas anserifera* Linnæus. Cherrystone, Virginia. Length of capitulum 27 mm.
2. *Lepas hillii* Leach. Menimsha, Marthas Vineyard, Massachusetts. Diagram of base of the capitulum.
3. *Lepas anserifera* Linnæus. Longitude 90° east, on the equator. Length of capitulum 19 mm.
4. *Lepas pectinata* Spengler, spinose variety. *Albatross* Station 2379, Gulf of Mexico. Length of capitulum 9 mm.
5, 6. *Lepas pectinata* Spengler, inflated variety, carinal and lateral views. Bering Island. Length of capitulum 16 mm.
7. *Lepas hillii* Leach. Menimsha, Marthas Vineyard. Length of capitulum 35 mm.
8. *Lepas pectinata* Spengler. Vineyard Sound. Length of capitulum 12 mm.

Plate IX.

Fig. 1. *Conchoderma virgatum* (Spengler). Woods Hole, Massachusetts. Length about 25 mm.

2. *Conchoderma auritum* (Linnæus). Cape Hatteras, on an iron buoy. Length about 83 mm.

3. *Lepas anatifera* Linnæus. Boca Chica Key, Florida, on drittwood. Length of capitulum 15 mm.

4. *Lepas anatifera*. Diagram of base of the capitulum showing the umbonal tooth (*t*) of the right scutum. Vineyard Sound, Massachusetts.

5. *Lepas anatifera*, typical form. Vineyard Sound, Massachusetts. Length of capitulum 21 mm.

6. *Lepas fascicularis* Ellis et Solander. *Albatross* Station 2425, off eastern United States. Capitulum 20 mm. long.

Plate X.

Figs. 1–3. *Verruca euglypta*, new species. Oblique view from side of movable valves; view from side of fixed scutum and tergum, and outline of rostral end. Type.

4–7. *Verruca darwini*, new species. Views of side of movable valves, top, and from side of fixed valves, and rostral end of the type.

8. *Verruca darwini*, top view of a topotype.

Plate XI.

Figs. 1–3. *Verruca calotheca*, new species. Top and carino-rostral views and outline of rostral end of the type.

4–6. *Verruca hoeki*, new species. Carino-rostral, rostral, and tergo-scutal views of the type, ×10.

7–8. *Verruca nexa alba*, new subspecies. Top and carino-rostral views of the type.

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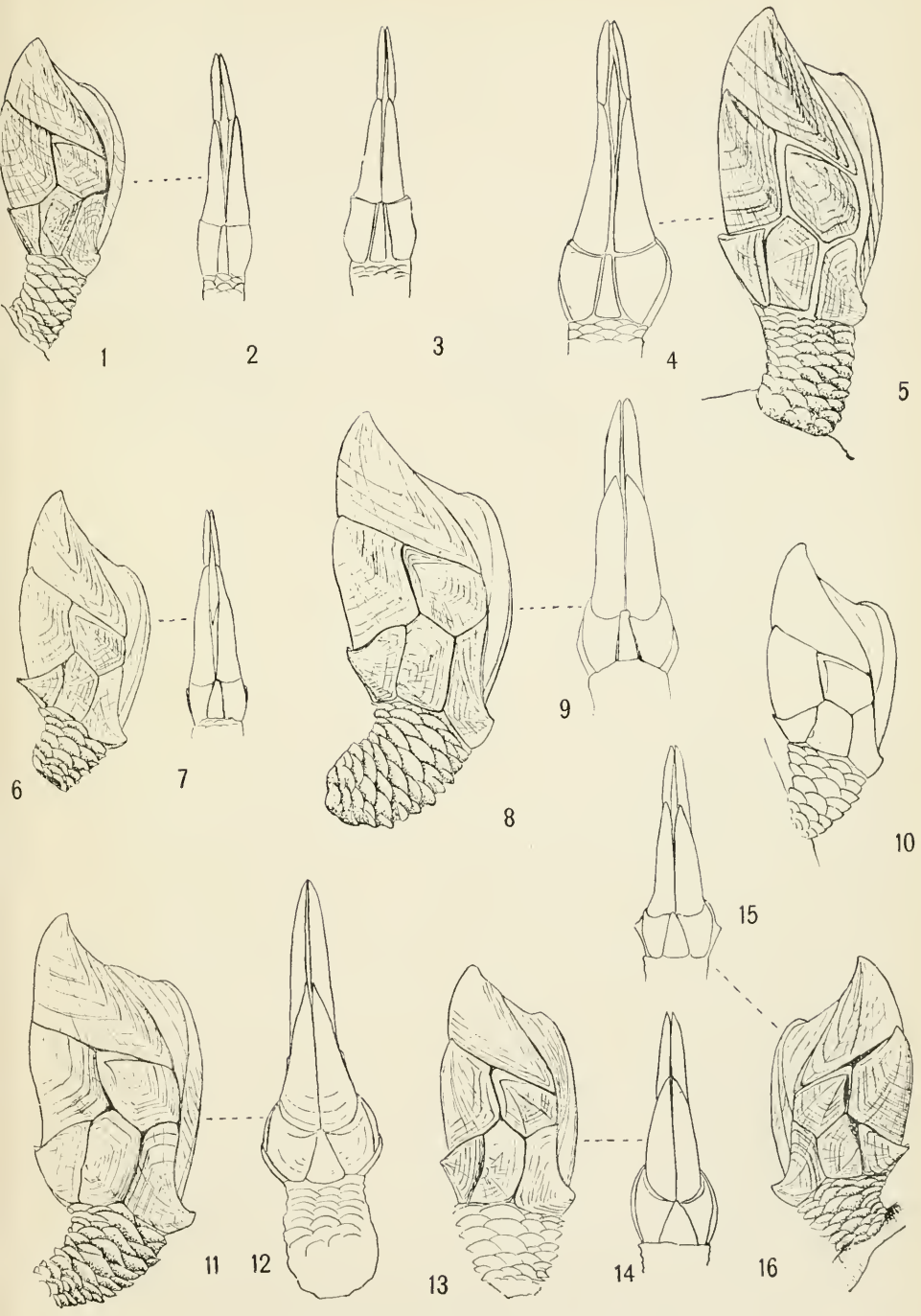

SCALPELLUM STROEMII AND ITS SUBSPECIES.

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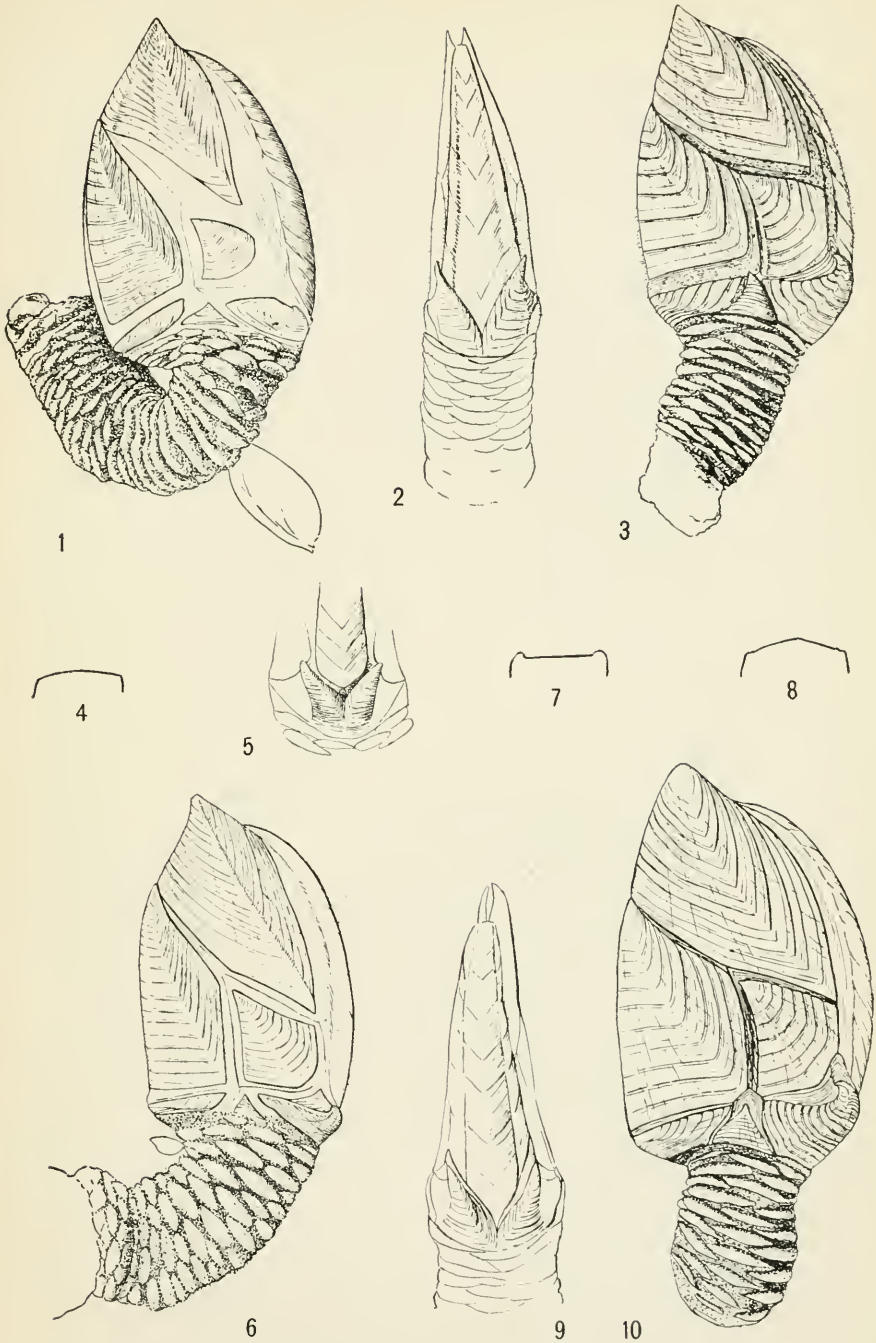
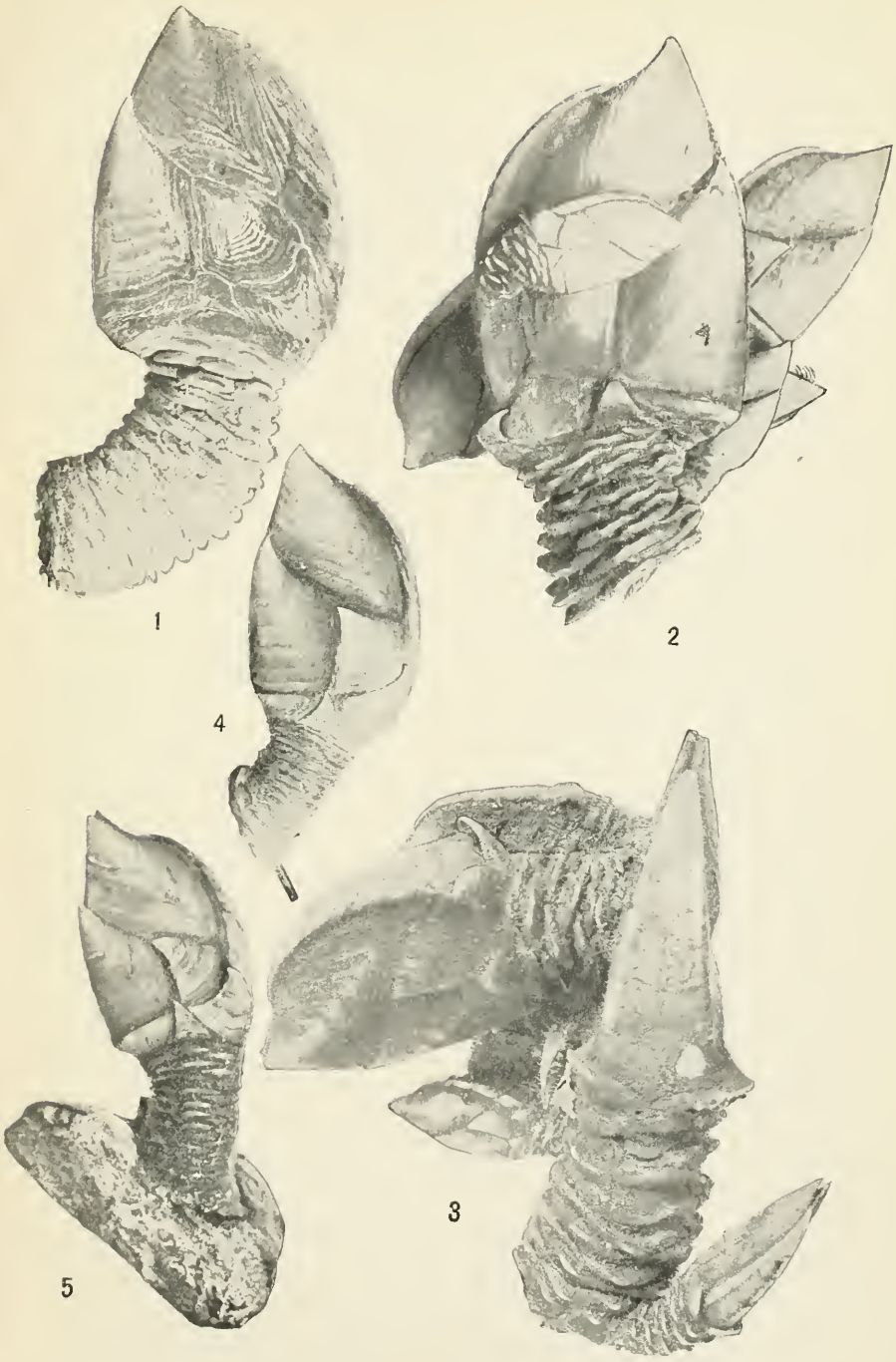


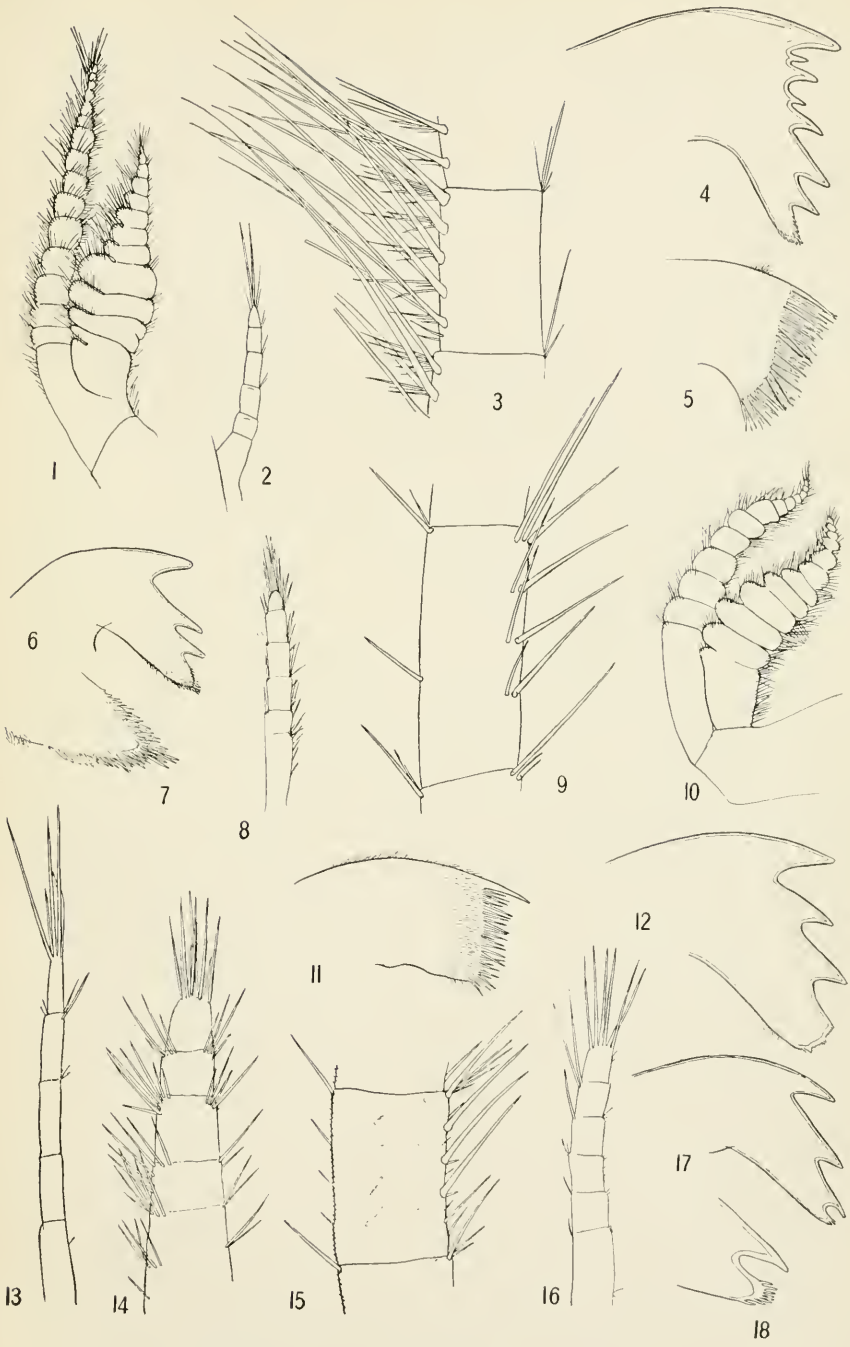
1, SCALPELLUM GIGANTEUM; 2, 3, 7, S. REGIUM LATIDORSUM; 4, 5, 6, S. REGINA; 8, S. REGIUM; 9, 10, S. REGIUM, VARIETY.

FOR EXPLANATION OF PLATE SEE PAGE 117



1, SCALPELLUM GIGANTEUM; 2, 3, S. VELUTINUM; 4, 5, S. REGIUM.

FOR EXPLANATION OF PLATE SEE PAGE 117.

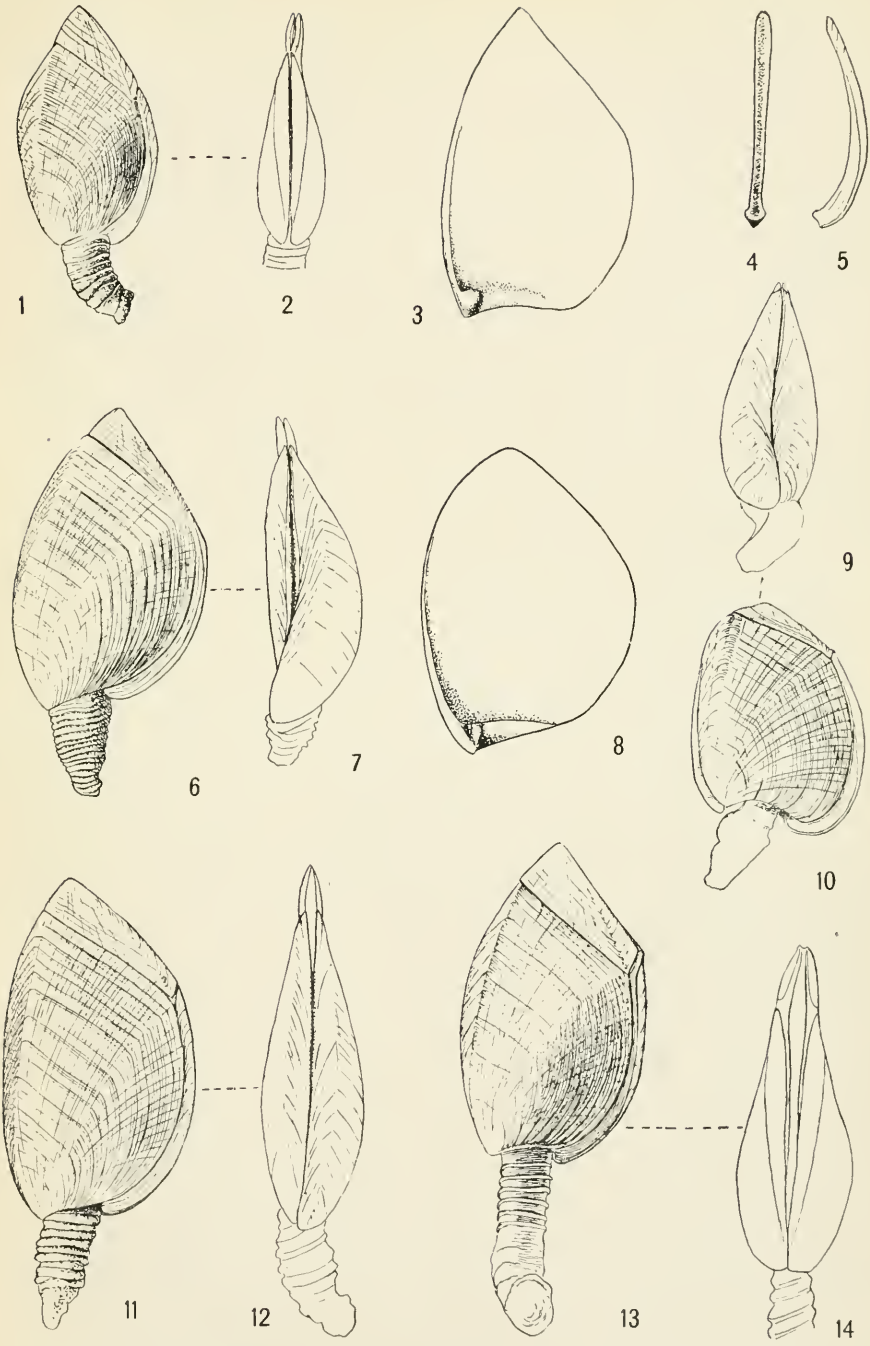


MANDIBLES, MAXILLÆ, AND CIRRI OF LEPADIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 117.

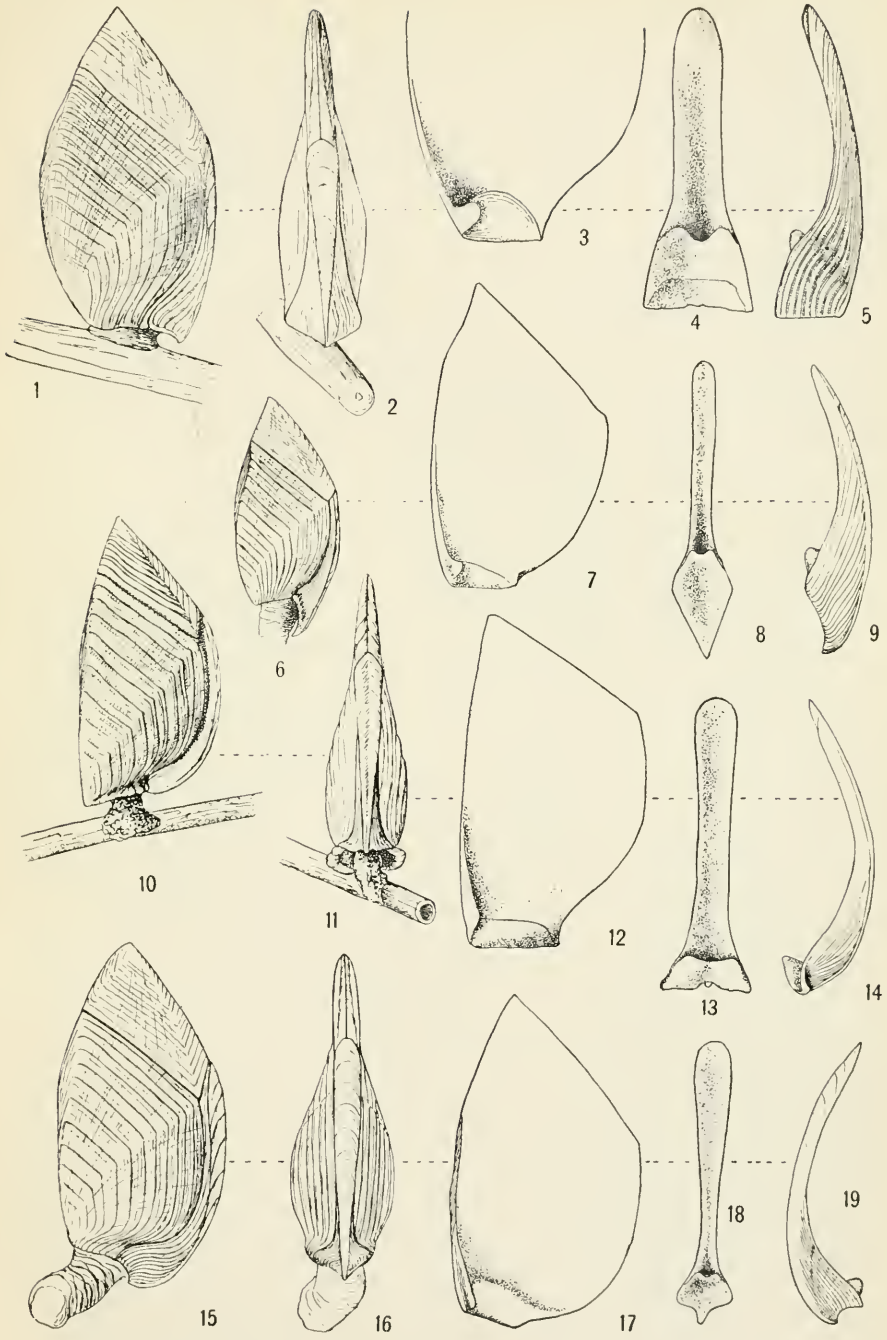
MANDIBLES, MAXILLÆ, AND CIRRI OF LEPADIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 118.



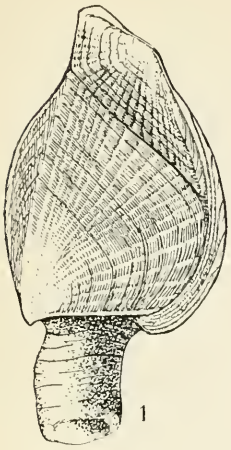
1, 2, Pœcilasma kæmpferi litum; 3-5, P. kæmpferi; 6-8, 11, 12, P. inæquilaterale; 9, 10, P. i. breve; 13, 14, P. k. novæangliæ.

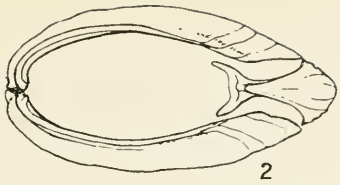
For explanation of plate see page 118.

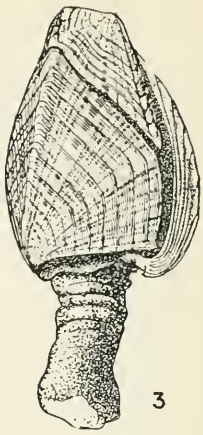


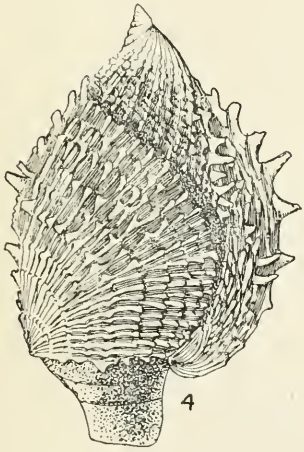
1-5, MEGALASMA SUBCARINATUM; 6-9, M. GRACILE GRACILIUS; 10-14, M. RECTUM; 15-19, M. ANNANDALEI.

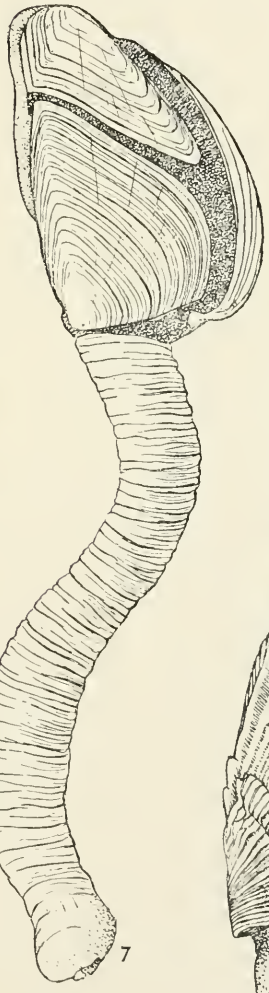
FOR EXPLANATION OF PLATE SEE PAGE 118.

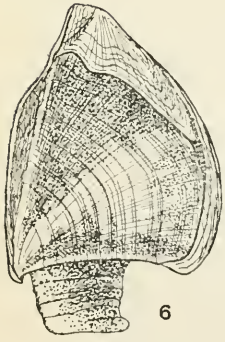


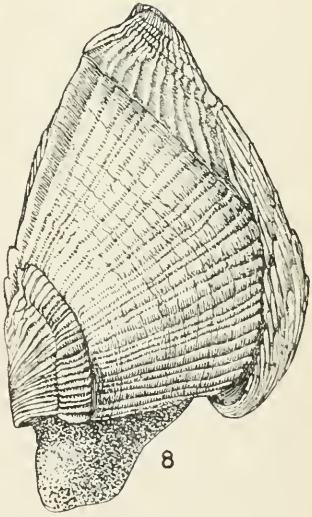






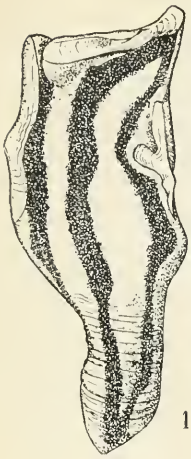


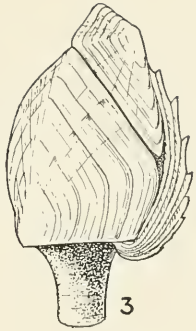


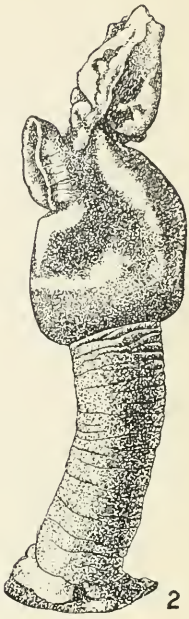


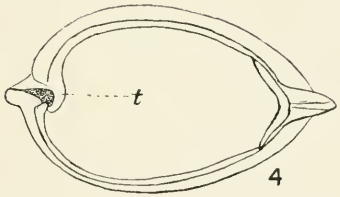
1, 3, Lepas anserifera; 2, L. hillii; 4, 5, 6, L. pectinata, Varieties; 7, L. hillii; 8, L. Pectinata.

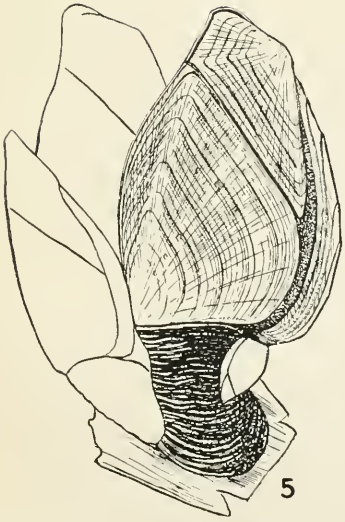
For explanation of plate see page 118.

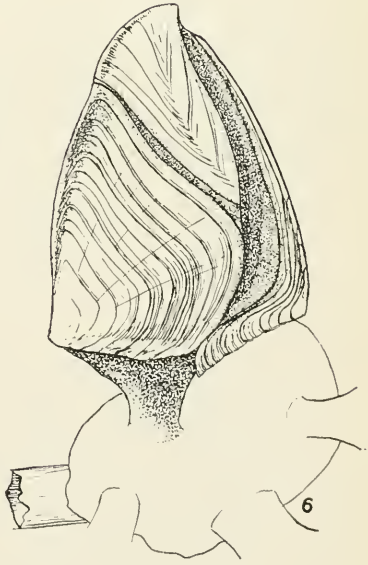






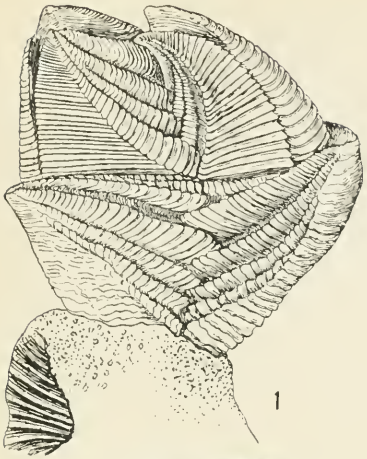






1, Conchoderma virgatum; 2, C. auritum; 3, 4, 5, Lepas anatifera; 6, L. fascicularis.

For explanation of plate see page 119.



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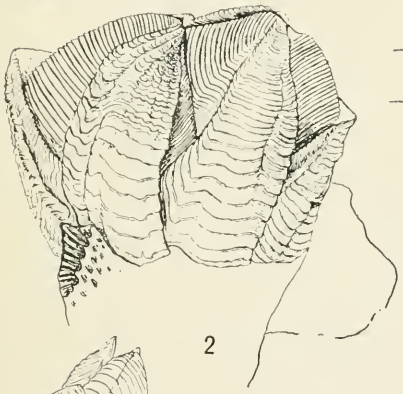

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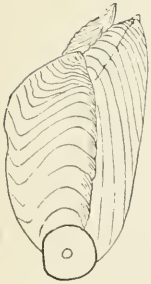

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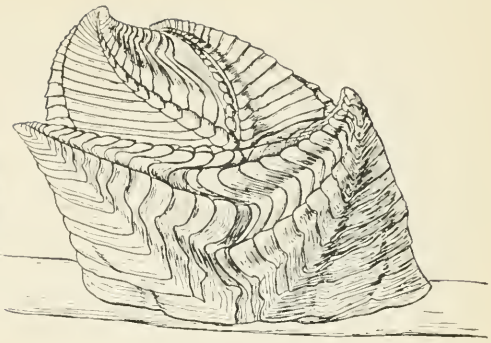

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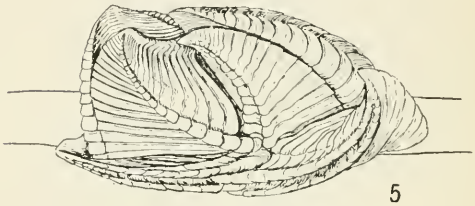

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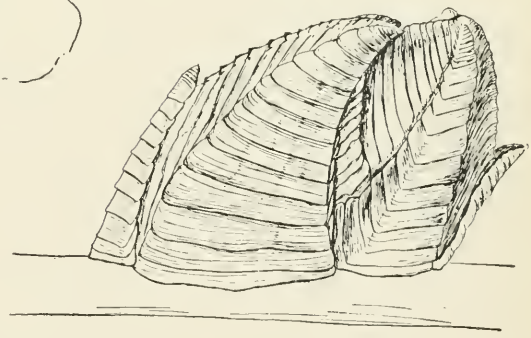

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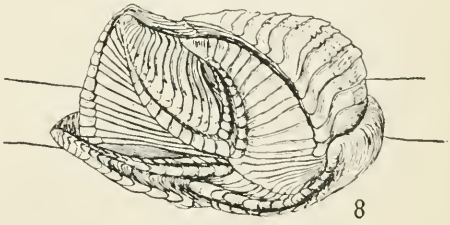

8

1-3, VERRUCA EUGLYPTA; 4-8, V. DARWINI.

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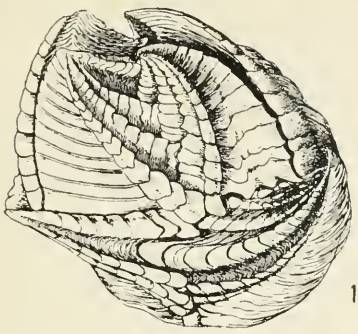

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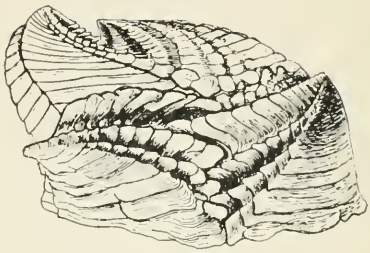

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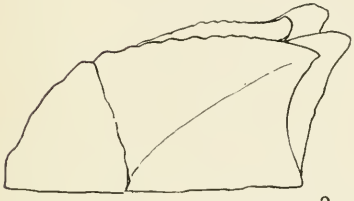

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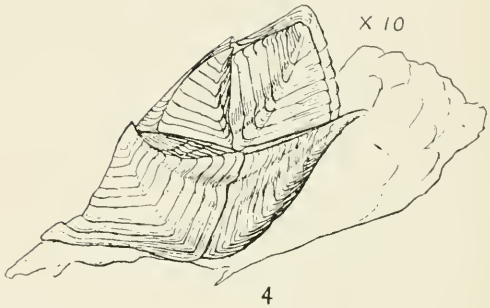

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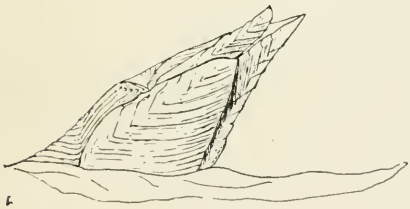

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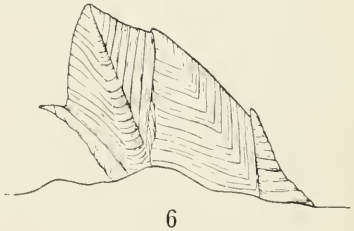

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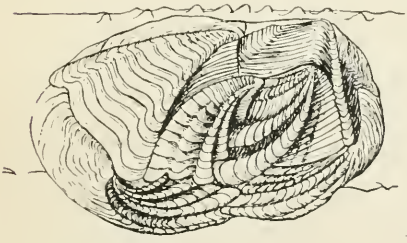

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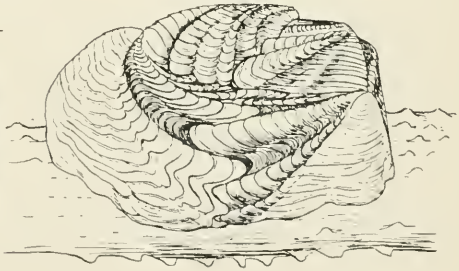

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1-3, VERRUCA CALOTHECA; 4-6, V. HOEKI; 7, 8, V. NEXA ALBA.

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